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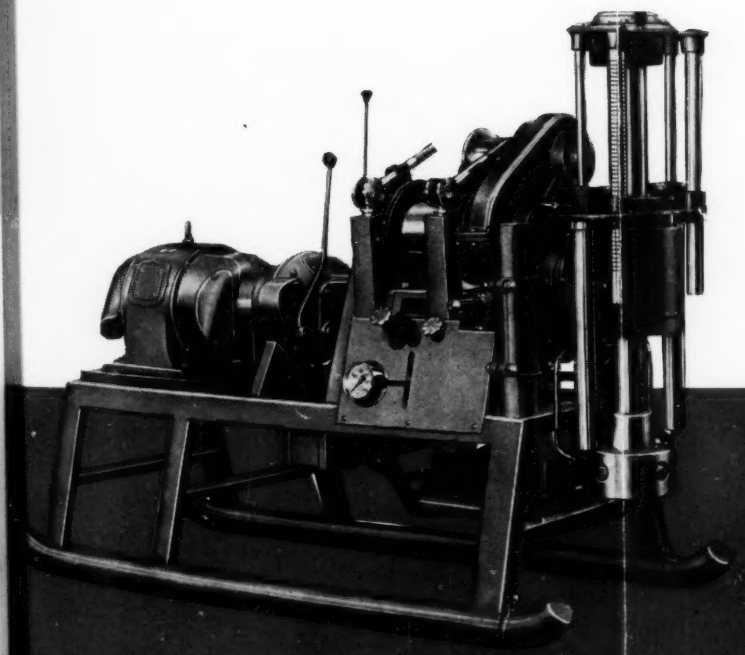

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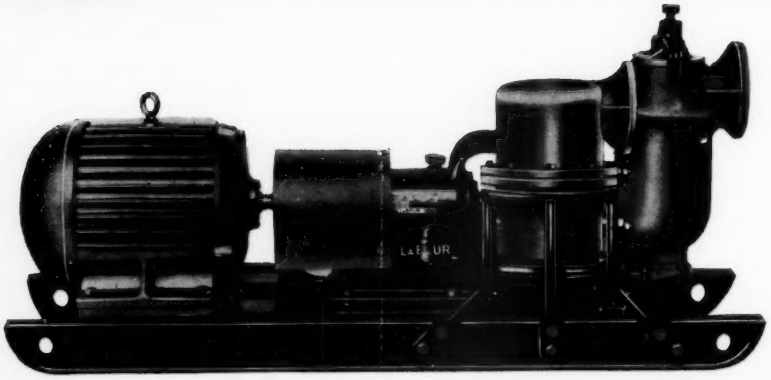

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International NU-SWIFT News

No. 1

HAVE YOU MET THESE PEOPLE?

1. The new 16-floor skyscraper in BASLE, Switzerland, built and occupied by GEIGY, the world-famous chemical concern, has been equipped with Nu-Swift extinguishers.

2. Old-fashioned chemical extinguishers in the SHELL-MEX Building, in the STRAND, LONDON, largest office building in the Commonwealth, have been superseded by reliable Nu-Swift equipment. Built in 1933, the 8,008,462 cubic feet of this giant edifice, which boasts 16 lifts, 6 oil-fired boilers and 22 miles of water pipes, are now protected by a total of 261 Nu-Swift extinguishers.

3. MONTEGO BAY AIRPORT on the North Coast of Jamaica, well-known to sun-hungry socialites in U.S.A. and Britain, is now safeguarded by Nu-Swift. So is the exclusive TOWER ISLE HOTEL.

4. In gay VIENNA, 30 break-down vehicles belonging to the TOURING CLUB OF AUSTRIA (similar to the British A.A. service) have recently been equipped with Nu-Swift. Another 31 vehicles in GRAZ have been similarly protected.

5. In STOCKHOLM, beautiful Capital of Sweden, a rush order for 1½ tons of extinguishers was recently executed by Nu-Swift sales concessionnaires in 6 hours. The number of extinguishers required was 60. SKF, ASEA and STORA KOPPARBERGS BERGSLAGS A/B (the oldest industrial undertaking in the world), are among other industrial giants in fast moving Sweden, who have standardised on reliable Nu-Swift Dry Powder Extinguishers.

6. If overtaken by the LAKE POLICE while speeding on the 20-mile long LAKE ZURICH, you will find their patrol boats equipped with Elland-made Nu-Swift Dry Powder Extinguishers, Model 1604. Ashore, this also applies to the police cars and garages of the City and Kanton of busy and prosperous ZURICH.

HAVE YOU BEEN TO THESE PLACES?

7. Direct rail connections link COPENHAGEN with Rome, Paris, Vienna, Venice, etc. THE DANISH STATE RAILWAYS have now equipped all international coaches starting from the up-to-date capital of Denmark, with Nu-Swift.

8. MR. HUGH DALTON, M.P., Chancellor of the Exchequer in the post-war Labour Government (1945-47), is the latest prominent politician to equip his home with Nu-Swift.

9. After exhaustive tests, extending over several years, the AUSTRALIAN ARMY have satisfied themselves that Nu-Swift Dry Powder Extinguisher, Model 1604, meets their exacting requirements. The first orders have been placed.

10. More than 50 per cent of all new NORWEGIAN vessels, mainly TANKERS, are protected by Nu-Swift.

11. Prince FAROUK, now a citizen of Monaco, but once King of EGYPT, one day when shooting in the desert near Cairo, saw his car ablaze. Fire was put out by a local Nu-Swift enthusiast. Result: The King had all his palaces and his yacht protected by Nu-Swift.

12. The underground aeroplane factories of SAAB (SVENSKA AEROPLANE A/B) Linköping, Sweden, are protected by Nu-Swift. So are the naval vessels in the ATOM-BOMB-PROOF UNDERGROUND HARBOUR near Stockholm, built into the mountain by the cautious Swedes.

13. In far-off FIJI, where cannibalism was rife within living memory, the recently constructed BROADCASTING STATION is protected against fire by Nu-Swift. So is the new AUTOMATIC TELEPHONE EXCHANGE'

14. An animated correspondence with G. BERNARD SHAW resulted in 1944 from an enquiry by the ever-alert but critical sage. Asked by Shaw why, in our letter of reply, no prices were quoted, a cheeky Nu-Swift clerk retorted that "We thought you wanted to protect your life, not your purse. Does price matter when your life is at stake?" G.B.S. rose to the bait by replying: "Please treat me as a prospective customer, not as a back-chat comedian."

15. SWISS FEDERAL RAILWAYS, one of the most efficient and modern railway systems in the world, have placed their first orders for Nu-Swift extinguishers.

16. Mr. W. J. SCOTT, Q.C., FIRE MARSHAL OF THE PROVINCE OF ONTARIO, during a recent lightning trip to Europe, as Dominion Government NATO delegate, included Elland in his itinerary. On his return, having also called at London, Paris, Rome and Madrid, he stated that the visit to Nu-Swift Factory remained the highlight of his European tour, and caused orders to be placed for sample and demonstration extinguishers for the new Ontario Fire Service College at GRAVENHURST, 80 miles from TORONTO.

17. Since THE SUDAN gained her independence, the authorities have decided to standardize on Nu-Swift. The first orders have arrived from Khartoum.

18. In KUWAIT, fabulously wealthy Arabian oil-well state on the Persian Gulf, police and army cars are now all protected by Nu-Swift.

19. The SOUTH AFRICAN ELECTRICITY SUPPLY COMMISSION have decided to place Nu-Swift Dry Powder Extinguisher, Model 1604, on all their breakdown and service vehicles. The first orders have been placed.

20. In NIGERIA, Africa, which is shortly expected to achieve independence, TRAINS AND HOSPITALS are equipped with Nu-Swift. Climate is hot and humid.

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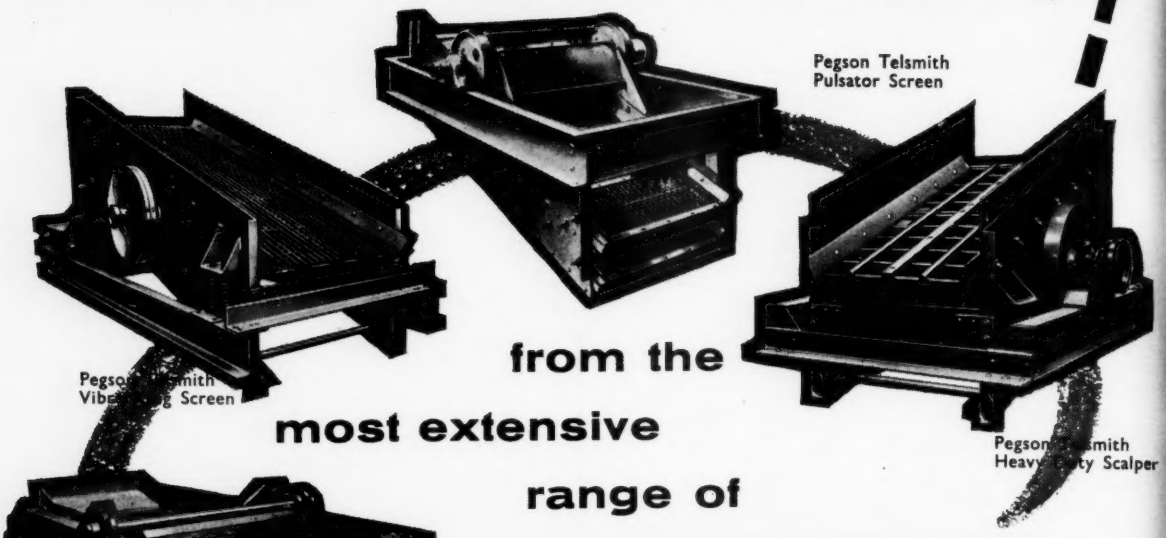

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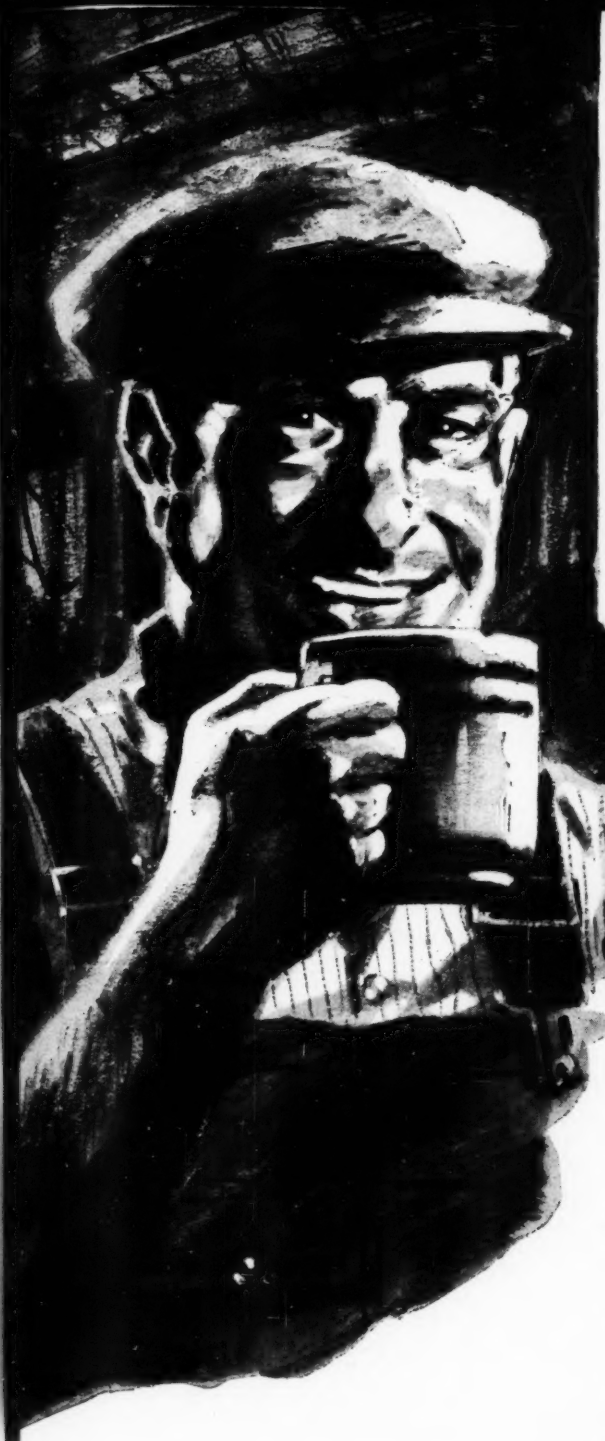
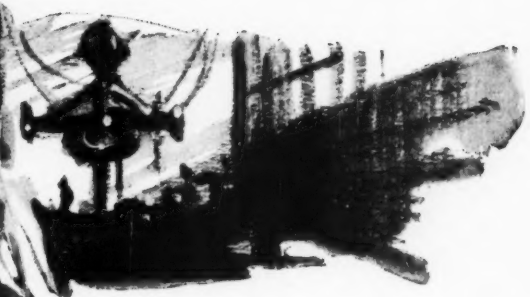


Helping to sweeten it is our cup of tea



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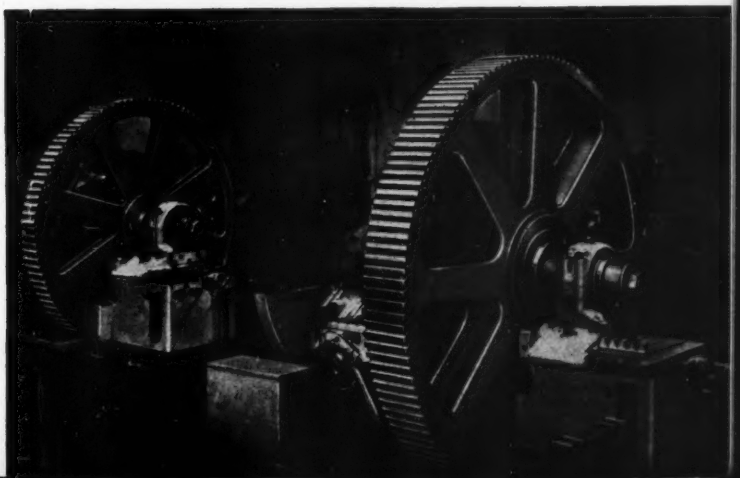

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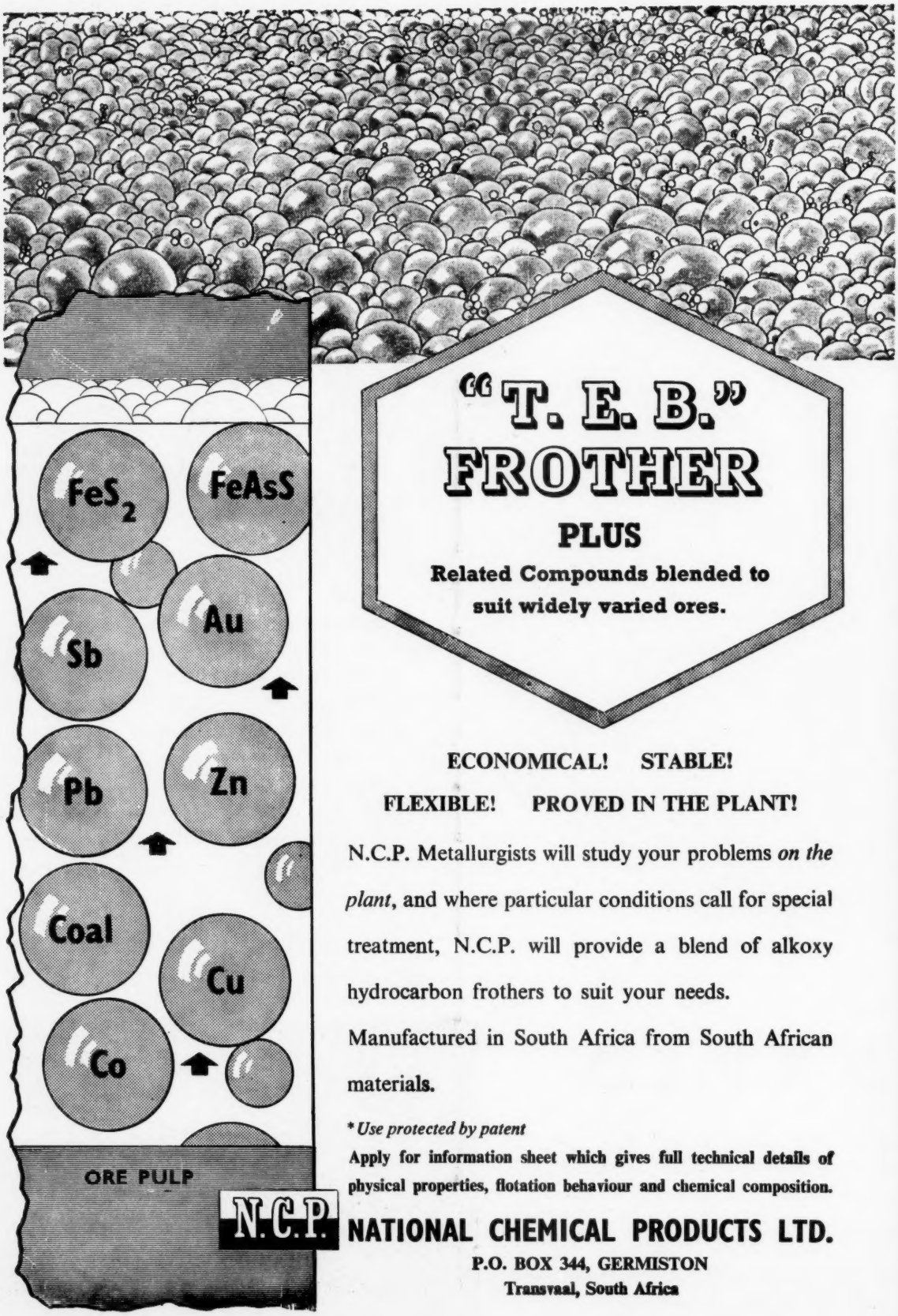

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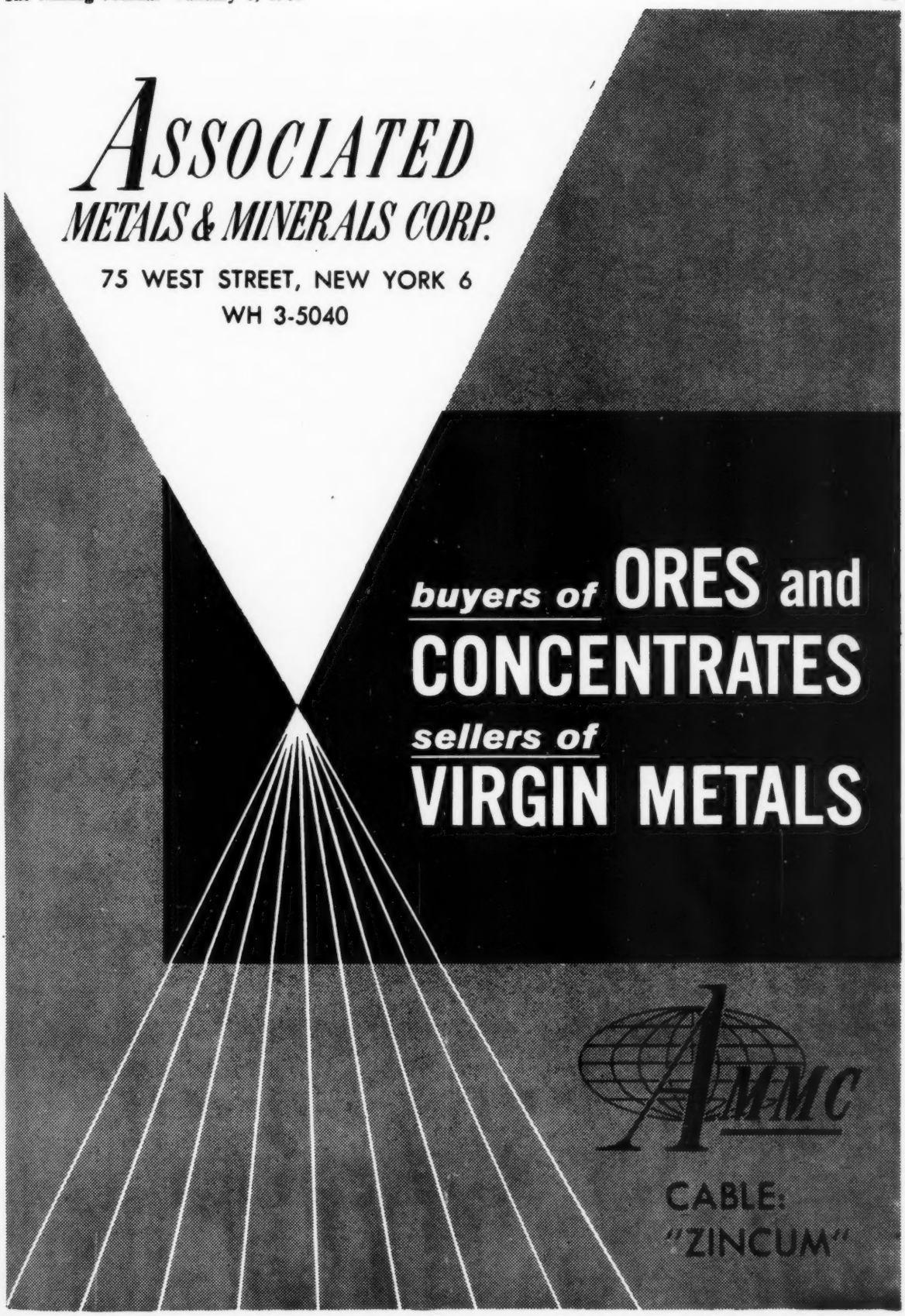
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The Mining Journal

London, January 8, 1960

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Durgapur Points the Way

ON Tuesday, December 29, the Durgapur steel plant in West Bengal was officially inaugurated by Dr. Rajendra Prasad, President of the Indian Republic. The centrepiece of last week's ceremony was the commissioning of the first of the plant's three blast furnaces. Both the remaining furnaces will be in operation by the end of April, 1961, and the plant is scheduled for final completion by the following July. Durgapur's rated capacity will then be 1,000,000 tons annually of ingot steel, 360,000 tons a year of pig iron, and some 800,000 tons of rolled steel products.

The contract for the Durgapur Steelworks, worth approximately £105,000,000, is the largest single export order ever obtained by Great Britain, and the project was described by Mr. Cuthbert Alport, Minister of State for Commonwealth Relations, as " the biggest single operation that British industry has undertaken ". Durgapur's greatest significance, however, lies in the manner in which the job has been approached rather than in the magnitude of the undertaking. Of particular interest to the mining machinery industry is the fact that the contract is being carried out by the Indian Steelworks Construction Co. Ltd. (ISCON), which is a consortium formed specially for the purpose whose members are thirteen of Britain's leading firms.

The very large scale on which major mineral deposits are being developed and brought to production suggests that the formation of consortiums on broadly similar lines to ISCON is an approach which in suitable circumstances might prove equally fruitful in the mining field. The 4,000 t.p.d. concentrator at St. Patrick's Copper Mines, in Eire, commissioned in October 1958, and claimed to be the most modern plant of its kind in Europe, was manufactured almost in its entirety in the United Kingdom. In this case the mill was designed by a prime contractor, working in association with a mining consultant and assigning contracts to a considerable number of sub-contractors. There might well be occasions, however, where, as in the case of Durgapur, orders are so large and complex that the financial and technical load is too heavy to be borne by a single firm acting as the prime contractor. Bearing in mind that for each large project a different combination of manufacturers is almost certain to be required, it is evident that, as a general rule, a consortium would only be of suitable composition to carry out the particular contract for which it was set up. The successful completion of each joint venture, however, should encourage the manufacturers concerned to seek further opportunities for collective action, so that, in time, consortiums might become an accepted feature of our export trade.

Another notable aspect of Durgapur is that the plant is a joint Indian-British effort, approximately 50 per cent of the capital expenditure and tonnage of raw materials being supplied by India herself. Of the 33,000 strong labour force the vast majority are Indian, including a high proportion of the skilled supervision. The number of British technicians working at Durgapur is, in fact, under 400. This is, of course, the type of labour pattern likely to be

encountered in varying degree in all overseas territories where British consultants and contractors are concerned with the equipment of mines and the installation of mineral extraction plants.

As an essential part of the agreement, when major contracts are negotiated with the Governments of underdeveloped countries, provision must usually be made not only for immediate labour requirements, but also for the training of technicians to operate the future plant. In order to provide for the operation of the Durgapur Steelworks, 350 Indian technicians are being trained through the Colombo Plan in the United Kingdom. In addition, the British Iron and Steel Federation has seconded technicians from the United Kingdom to Hindustan Steel Ltd., to assist in the initial operation of the steelworks and to complete the training of the Indian technicians. This, too, is a type of problem with which British consultants and contractors will be confronted to an increasing extent when building large mills and smelters overseas.

So wide, in fact, are the issues involved in the supply and installation of mining and metallurgical plants that such major break-througns as the Durgapur contract can only be achieved through the combined and co-ordinated efforts of Government departments, consultants and commercial firms. An essential preliminary to the signing of any contract is what might be termed the obverse to " aid with strings ", namely a loan or grant, which in the case of Durgapur, amounted to a British Government loan of £15,000,000, plus a letter of credit for £11,500,000 arranged by Lazards from various British banks.

If the difficulties for our machinery and equipment exporters are great, so too are the opportunities, and, so far as Asia is concerned, prospects have been further improved by the proposed change in the distribution of United States economic aid throughout the Far East. Henceforward U.S loans will take the place of grants and priority will be accorded to countries which buy American equipment and material. India, in particular, is reported to be seriously disturbed by the " Buy American " ruling. If all loans by the United States Development Loan Fund must be spent on purchases in the United States, the cost of her development programme over the next five years will be increased by some 50 per cent.

The British Treasury has been consistently opposed to the principle of " aid with strings " and this attitude appears to be shared in some Continental countries, where there is growing support for the view that financial assistance should be on an international basis, canalised possibly on the World Bank pattern through the proposed International Development Association or some other suitable agency. The consultancy and technical assistance for carrying out extensive capital programmes would then be on a competitive basis. This is another cogent reason for encouraging the formation of consortiums by British firms.

Durgapur might aptly be described as Britain's shop window in the Far East. The inauguration ceremony has been a most timely advertisement for our manufacturers and technicians, and the extent of British financial participation in the project will not have escaped the attention of Asian countries. This is a situation which might well prove beneficial to British exporters of mining machinery and equipment, more especially in view of the growing emphasis on minerals development in most Far Eastern countries.

STEEL PEACE — AT A PRICE

After lasting for eight months and bringing the production of steel virtually to a standstill for half that time, the steel dispute in the U.S. has at last been settled. Its termination will be viewed with relief not only in America itself but throughout the Free World and not least by the mining industry, whose products, even when not themselves directly consumed in the making of steel, can scarcely be unaffected marketwise by the condition of the American economy.

At a time when production in the Communist countries is being expanded at a truly formidable rate, it is indeed deplorable that the economy of the mightiest bastion of Free Enterprise should have been disrupted by a stoppage which would not have been tolerated under the dictatorships with which the West has to compete.

The ending of the major dispute will doubtless lead to an early settlement of the other labour disputes now in progress or pending, such as the copper strike (apparently in its closing phase), and the threat of possible strike action at the docks.

Unfortunately, satisfaction that there will be no further suspension of steel production must be tempered by the heavy cost at which peace has been bought. On the face of it, the settlement must be regarded as a signal victory for the Union, since the terms are substantially higher than the employers' last offer and the vexed question of " featherbedding " has for all practical purposes been shelved. According to Mr. Roger Blough, chairman of the United States Steel Corporation, the cumulative cost of the new agreement to the steel industry will be more than $1,000,000,000. It remains to be seen what this means in terms of inflation. Although no general price increase is planned in the immediate future, there can be little doubt that sooner or later some part of the higher costs will have to be passed on to consumers, thereby further weakening the competitive position of American manufacturers at home and abroad and making it still more difficult for the Federal Reserve Board to prevent a further decline in the dollar, more especially in an Election year.

The fact that the terms of the settlement were " suggested " by Vice-President Nixon and the Secretary of Labour, Mr. James Mitchell, is an unhappy, though in the circumstances perhaps unavoidable, instance of Government intervention in the fixing of wages, which has created a most unfortunate precedent for future Administrations when industrial disputes arise. What a price America has to pay for her Electoral system !

Meanwhile, with the steel mills operating at full capacity to catch up with orders, the last immediate threat to the continued uptrend in Free World industry has been removed. There is now every reason to believe that for most sections of the mining and metal industries, 1960 will be a year of prosperity and expansion.

PRODUCING HIGH MELTING POINT METALS

An electron beam furnace has been successfully used on both pilot and plant scale to melt, refine and cast such special metals as titanium, zirconium, tungsten, tantalum, molybdenum, beryllium and columbium. The metals so processed are extraordinarily pure and, as a consequence, often have unique physical properties. For example, ductile columbium, which was previously only a laboratory curiosity, has been made in commercial quantities by electron beam furnacing.

Utilizing electron bombardment in a high vacuum the furnace melts chemically-active materials with high melting points. Techniques have been developed which make possible the volatilization and removal of certain critical impurities from the processed metals. This results in end product metals which are of unique purity and have properties not attainable by any other method.

The process is based primarily on high vacuum techniques. Heat to melt the metal charge is supplied by an electron gun which serves as the cathode and bombards the melt stock (the anode) with electrons. The molten metal drops into a water-cooled crucible. The heat required to maintain a pool in the crucible is also provided by electron bombardment. The surface of the molten pool is kept at a constant level as the solidified ingot is withdrawn downward.

Differing in principle from arc melting not only in the heating mechanism (high-voltage electron bombardment rather than an electric arc), the process also differs in the level of vacuum used. The electron beam furnace vacuum is .01 to 0.1 microns; arc furnace vacuums usually range from 10 to 100 microns.

Under conditions existing in the electron beam furnace, carbon, hydrogen, and oxygen generally are removed rapidly as carbon monoxide, metal oxides or similar gaseous compounds. As a rule, impurities which form compounds which have a vapour pressure of at least 10^{-5} atmospheres at the surface of the melt are removed easily.

Electron beam melting will probably find its greatest use in the purification of refractory materials and high-melting metals such as columbium, tantalum, tungsten, beryllium, vanadium, molybdenum and special stainless steel alloys. The immediate significance of the process is two-fold: the process will make available, for the first time, commercial quantities of high purity materials at substantially lower cost, electron beam melting being expected to stimulate development of many newer metals; in many cases, the process permits the recycling of scrap. Such recycling is particularly significant in view of the relatively high cost of many of these metals.

Electron beam melting has several important advantages over arc melting. For example, electron beam operations can be stopped and started at any time whereas arc melting cannot. In the latter process a valuable ingot may be lost if it becomes necessary to halt the melting process. Also, the molten metal can be maintained in superheated conditions for periods of time which may be varied at will. Moreover, the electron beam furnace can melt material in any form—ingot, powder, flake or sponge; the arc process requires compacted material.

Electron beam melting can also be used for zone refining. In some respects it should prove superior to present zone refining processes. A major attribute of electron beam melting is that there is no apparent limitation to the diameter of the bar or ingot that can be processed, as has been the case with highly reactive metals processed by conventional zone refining operations. Consequently, electron-beam-melted materials can be processed faster and cheaper.

The economics of electron beam melting look very favourable at the present stage of development because high voltage DC electrons are relatively cheap and power efficiencies are high. For instance, the purification of columbium requires about 3 to 4 kWH per pound, tantalum about 6 to 8 kWH per pound. By comparison, the solid state sintering of tantalum requires about 500 kWH per pound.

Pioneering the development of the electron beam furnace in America is the Stauffer-Temescal Company, an affiliate of Stauffer Chemical Company. This company is now designing and building electron beam furnaces for use under licence and is also developing a new family of metals for solid fuel rockets.

These metals are alloys of tantalum and tungsten, which, with the exception of rhenium, have the highest melting points of any known metals. They can withstand the tremendous heat developed in large rocket motors and yet be produced at relatively low cost, being also easily fabricated and machined.

The application of these alloys to critical rocket components is the result of a joint effort of Aerojet-General Corporation and Stauffer-Temescal Company.

The tantalum-tungsten alloys have melting points which range between 5,430 deg. and 6,150 deg. Fahrenheit—the melting points of pure tungsten and pure tantalum. The tensile strength of worked 90 per cent tantalum, 10 per cent tungsten alloy is 150,000 pounds per square inch at room temperature. At 4,500 deg. Fahrenheit the tensile strength is still about 15,000 p.s.i.

Because of the exceptional purity imparted to the alloys by electron-beam melting, ingots can be worked and fabricated with conventional steel mill equipment and techniques, and can be machined by standard tools. This, coupled with the fact that scraps can be directly recycled through the furnace, permits the production of finished shapes at relatively low cost.

The alloys are now being produced in five-inch diameter ingots up to 42 inches long, and in fabricated forms or sheet.

UNGAVA PLAN FOR 1960

According to a statement made in Rotterdam recently by Mr. J. H. Oerlemans, director of the Dutch hard coal traders' body Steenkolen Handel Vereniging, the much-disputed project to exploit iron ore in the Ungava Bay region of Labrador for shipment to Rotterdam is to be put into effect in the current year (1960). The owner of Universe Tankships Inc., Mr. D. K. Ludwig—one of the leading tanker owners in the world—has now, announced that he is prepared to back the project, which is to be operated by the Ungava Iron Co.

This company has been formed by International Iron Ores Ltd., Cleveland-Cliffs Iron Co. and Steep Rock Iron Mines Ltd. on the one side and the West German iron and steel producers Bochumer Verein für Gussstahlfabrikation AG, Hüttenwerk Oberhausen AG, Friedrich Krupp, Mannesman AG, Hoesch AG and Westfalenhütte AG on the other. The key to the company's starting of the project has been Mr. Ludwig's statement of intention to build special vessels of 72,000 tons for ore transportation as required in the scheme.

All ore shipping will have to be carried out in the period July 20 to November 20 each year, as only during this period is the bay free from ice. This means that direct transport from Labrador to Europe from the best embarkation point, Hopes Advance Bay, is impossible for most of the year. Due to this difficulty, it has been decided to build a transit port on the west coast of Greenland, which is free from ice all the year round. The complete annual production would then be shipped from the exploitation site to this Greenland port during the July 20-November 20 period, and ore would be transported on from Greenland to Europe during the rest of the year.

After detailed examination, it has been decided to build this new port on Rype Island in the Kobbe Fjord, barely three miles from the capital town of Gothaab. Distances are Hopes Advance Bay-Rype, 588 sea-miles, and Rype-Rotterdam, 2,355 sea-miles. As a direct route Hopes Advance Bay-Rotterdam would in any case be 2,630 sea-miles, the detour via Rype is one of no more than 313 sea-miles.

The ore carriers planned to be built by Universe Tankships will have a length of 855 ft. and will draw 42 ft. of water. Four such ships, each of which will be a 72,000-tonner, will be built at a total cost of some $60,000,000 U.S. Speed of the ships will be around 15 knots.

The weight of 72,000 tons has proved to be that at which the most economical operation is obtained from a vessel; over 72,000 means a loss in economy. Cost saving for ore transport ships has been worked out as 32 per cent for 45,000-tonners as compared with 30,000-tonners, 19 per cent for 60,000-tonners as against 45,000-tonners and 4 per cent for 72,000-tonners as compared with 60,000-tonners.

While other plans are being worked out, negotiations are being held with the Danish Government to lease the islands of Rype and Tartunguak, as well as certain mainland sites, for 90 years, and to build port installations worth 21,000,000 U.S. dollars. After preparatory work by the firm of Danish Arctic Contractors, a number of Danish firms would attend to the erection of the port.

CANADA'S MINING INDUSTRY IN 1959

" This has been an excellent year for the Canadian mining industry and 1960 could be better ", states *The Northern Miner* in introducing its Annual Review Number for 1959, from which the information in this survey has been extracted

IN the past ten years the value of Canada's mineral production has risen by over 300 per cent and is now in the region of $2,000,000,000. The mining industry's capital expenditures total more than $500,000,000 a year and annual wages and salaries to the 145,000 people engaged in mining exceed $609,000,000.

The Northern Miner places the total value of Canada's overall mineral production in 1959 at a probable $1,900,000,000, which compares with $1,690,000,000 in 1958 and the former record of $1,700,000,000 in 1957. Estimates for the leading products (1958 figures in brackets) are as follows: Gold $155,000,000 ($154,000,000), major base metals $600,000,000 ($509,000,000), iron ore $187,000,000 ($122,000,000), uranium $320,000,000 ($290,000,000), and asbestos $105,000,000 ($96,000,000).

In reviewing the progress of the mining industry, and its position in the Canadian economy, the Hon. Paul Comtoin, Minister of Mines and Technical Surveys, points out that no other industry has been a greater stimulant to Canada's development or has done so much to populate outlying regions. Entire towns have arisen almost overnight.

Mine products are Canada's leading export. In 1958, approximately $1,713,000 worth of mineral commodities were sold outside the country — more than double the figure for 1950. Uranium and iron ore were the leading minerals responsible for a substantial increase in Canada's mineral exports in the first nine months of 1959, and an increase of 5.7 per cent in the country's total exports. Exports of iron rose from $79,200,000 to $110,800,000. Shipments of uranium increased from $184,400,000 to $230,000,000.

On the debit side, Canada's output of coal, on the decline for the past eight years, recorded a further drop of 1,000,000 tons in the first seven months of 1959. The Gordon Commission has reported, however, that, while production may continue to fall until mid-1960, the increased demand for metallurgical coke and the growth of thermal electric power plants may well turn the tide.

The effects of world over-production were reflected by reduced Canadian production of lithium, cobalt, and a number of other less prominent minerals.

Iron Ore

A special section of the Annual Review Number is devoted to iron ore. Canada today stands on the threshold of the biggest and boldest expansion its youthful iron ore industry has ever seen, writes Maurice R. Brown. Calling for expenditures of well over $1,000,000,000 in the next five years, output will rocket to 44,000,000 tons (more than double the 1959 record of 21,000,000 tons).

Nothing could be more timely for Canada than the advent of the St. Lawrence Seaway, which opens the Quebec-Labrador trough to the entire Great Lakes region — the very heart of the North American steel industry. Along the Quebec-Labrador trough, diamond drillers have indicated many billions of tons of low grade open pit ore that the metallurgist finds he can concentrate cheaply and readily. The Quebec-Labrador concentrates can be mixed directly with other low grade ores to make an ideal blast furnace feed. As a result, concentrates from the Wabush area show every sign of becoming the world's largest single source of iron ore.

Canada felt the effects of the depression in 1958, when iron ore output fell from 19,885,714 tons to 14,176,786 tons. In 1959, however, production is expected to reach 21,000,000 tons. Exports could be close to 18,000,000 tons, compared with more than half that amount in the previous year.

In 1958 there were over 100 mining companies carrying on exploration work on iron-bearing properties in Canada. This phase of the boom has now petered out and the steel companies themselves are taking over the better prospects. The only new producer in 1959 was Lowphos Ore Co., a subsidiary of National Steel Corporation, which started its new beneficiation plant near Capreol, Ontario, in May, turning out concentrate at the rate of 550,000 tons per year. Next year will see initial production from Inland Steel's Caland Ore, which is scheduled to deliver 750,000 tons of direct shipping ore from an open pit operation on its leased property in the Steep Rock range.

Three undertakings in the Quebec-Labrador trough — U.S. Steel's Quebec Cartier, Iron Ore Co.'s Carol Project and Pickands Mather's Wabush Ore Co. — call for an expenditure of over $700,000,000. Quebec Cartier's Lac Jeannine concentrator is scheduled to start in January, 1961, and will have a capacity of 8,000,000 tons of concentrate annually. There are tentative plans to follow this with a plant of similar size at near-by Mt. Reed. On completion of a joint railway early next spring, Ioco will start construction of a plant at Carol Lake to turn out the first concentrates in 1962. It will have a capacity of 6,000,000 tons per year, with tentative plans to double this. Close on its heels will be the big plant of Wabush Ore. This is expected to come into production in 1964 and will have an initial capacity of 5,000,000 tons, which is to be doubled. Other projects now on the drawing boards along the Labrador trough include a concentrator for Labrador Mining at Wabush, another for the Eaton-Krupp Ungava Iron Ores at Hopes Advance Bay, and yet another for Jones and Laughlin's Normanville Mining Co.

Potential new producers in other areas include Anaconda Iron Ore (Ontario), whose project, now in the pilot plant stage, could run to $200,000,000. In North-Western Ontario, the Cleveland-Cliffs organization is taking a serious look at the Bruce Lake property or Iron Bay mines. Premium Iron Ores plans to construct a plant at the Lakehead for the direct reduction of Steep Rock ore into pig iron.

The decision of Consolidated Mining and Smelting Co. to proceed with the construction of a multi-million dollar iron-steel plant at Kimberley, B.C., marks another milestone in that company's continuing efforts to recover the maximum wealth from the huge orebodies at its Sullivan mine.

Base Metals

Nickel and copper both did much better in 1959. This was partly because International Nickel, the leading producer of both metals, was closed for many weeks of the previous year by a strike, but largely because of the strength which became apparent in the demand for both metals. It is possible that Canadian production in 1959 may have reached an all-time high.

In the first seven months domestic consumption totalled 72,421 tons, being 4,000 tons more than in the corresponding period of 1958. Over the same periods, however, exports fell to 123,178 tons from 166,054 tons. The main reason for the decline was probably the U.S. import duty of 1.7c. that was re-instated in mid-1958. There was some improvement in the last quarter of 1959, as American new users made new efforts to obtain Canadian copper to replenish inventories depleted as a result of the strikes, but the duty remains a serious obstacle to Canadian producers. The other obstacle to Canadian export business, and one which affects all export industries, is the continued premium on the Canadian dollar.

Canada's copper picture, minewise and prospect-wise, was relatively unexciting during 1959. The established producers, their weaker members having been weeded out in the difficult years 1957-58, continued to operate without much change of pace. Most of the development prospects, for which the future seemed bright a couple of years ago, have ceased operations, leaving only a few properties with hopes and plans for production. Extensive surface drilling was continued by a number of companies in the Mattagami area.

This year, output of nickel has been close to capacity. Free world consumption is catching up with the rapidly expanding production. This is attributed to the producers' intensified drive to increase nickel uses and to the expanding consumer markets created by the buoyant economies of the Western world. That the gap is being closed so quickly, despite the prolonged U.S. steel strike, is a most encouraging development for Canada.

Many of Canada's zinc mines cut back production in 1958 and early 1959 due to the then low prevailing prices. This was followed by voluntary cutbacks later in the year under the producers' agreement. As a result, Canadian production of primary zinc in all forms was expected to fall by some 7 per cent, or about 30,000 tons, below the 422,330 tons produced in 1958.

A significant development for Eastern Canada's zinc industry during 1959 was the decision to set up a zinc roasting plant and sulphuric acid plant at Port Maitland, Ontario. This plant, which is scheduled for completion about mid-1960, will be the first in Eastern Canada to treat zinc beyond the concentrate stage. It is being constructed by Sherbrooke Metallurgical Co., a wholly-owned Canadian subsidiary of Matthiesen and Hegler Zinc Co., of LaSalle, Ill.

Gold, Silver and Uranium

Gold production in 1959 was running at roughly the same rate as the 4,500,000oz. produced in 1958. Domestic producers were aided by the government subsidy under the Emergency Gold Mining Assistance Act, which was extended to the end of 1960. However, income to the mines was seriously cut by the high premium on the Canadian dollar, which lowered the domestic price of gold to an average of less than $33.65 per oz., with recent quotations running less than $33.20. This compares with last year's average price of $33.97 and with $33.56 in 1957. Despite the difficulties imposed by the low price, some segments of the industry were able to show improvement. Mine managements showed a high degree of ability in improving operating efficiency. In some areas, such as Red Lake, favourable ore developments helped the profits picture.

There was a marked increase in silver output during 1959, largely because of higher recovery at United Keno Hill and Siscoe Metals. The other producers of importance, most of which extract silver solely as a by-product of base metal operations, showed little net change from 1958.

With a record production of about 15,500 tons, Canada's output of uranium oxide was exceeded only by the United States. A declining Canadian production is possible, however, as a result of the "stretchout" proposals. Successful producers will continue at their present operating rates, but it is expected that those companies which are in difficulty, whether through lack of good grade ore or financial trouble, will sell their contracts to the stronger companies. Deliveries against the purchased contracts would be deferred to the period from 1962-63 (i.e., when the buying company's own contract expires) up to November 30, 1966.

The major changes in Canadian uranium mining affairs during 1959, except for the cancellation of the U.S. options, were extensions to the original contracts arranged with Algom, Bicroft, Gunnar and Pronto. In general, these additions will permit the companies to continue capacity operations until early 1962, although, with the exception of Gunnar, they will receive the lower price of $US8 per lb. for the additional output.

Asbestos and Potash

The Canadian asbestos industry is recovering from the setback experienced in 1958. Production has been running about 15 per cent ahead of that year, or on a par with 1957. Canadian shipments of asbestos during the first nine months of 1959 amounted to 757,287 tons of all grades, compared with 657,086 tons in the corresponding period of 1958. If the gain was held in the fourth quarter, the year's output should have totalled around 1,038,000 tons, against 942,135 tons in 1958. Exports in the first nine months of 1959 totalled 729,761 tons of all grades, being an increase of 19 per cent over the 610,670 tons exported in the corresponding period of 1958.

One of the more promising developments in the field of potential new producers is the Advocate Mines' property on Burlington Peninsula, on the north coast of Newfoundland. Here a two-year exploration and development programme is being carried out. Four companies, namely, Canadian Johns-Manville, Patino of Canada, Amet Corp., and Financiers Belges de l'Asbestos-Ciment S.A., have an option to bring the property into production if results warrant.

The first potash to be mined in Canada other than by solution was brought to the surface by Potash Co. of America Ltd. in November, 1958, from its mine near Saskatoon, Saskatchewan. Since then a very considerable tonnage has been mined from this deposit. Over $20,000,000 has been spent on mine and surface plant designed to produce about 600,000 tons of finished products annually, of which over two-thirds will be exported.

At Esterhazy, north-east of Regina, International Minerals and Chemicals Corp. (Canada) Ltd. is sinking a shaft to potash deposits situated at a depth of 3,000 ft. The operation has been held up by a heavy flow of water encountered at 1,200 ft. Freezing of the water-bearing sandstone is now proceeding and shaft sinking will soon be resumed.

Continental Potash Corp. is to resume shaft sinking on its property near Unity. Plans have been made for production at the rate of 200,000 tons a year.

THE PROBLEM OF DUST IN METAL MINES

By SAMAR BANDYO

CONTRARY to dust problems in coal mines, those in ore-mines have not so far received the attention they deserve. The reason lies chiefly in the harmlessness of ore-dusts as far as explosions are concerned. Owing to their explosibility, the dangers of coal dust were recognized quite early and efforts were made to combat them. Only comparatively lately the danger of dusts to human lungs has been fully recognized, and measures are slowly being taken to lower the incidence of silicosis. Since dusts once inhaled and retained by human lungs show their ill effect in the form of lung diseases after years have elapsed, the effectivity of dust combating efforts does not make itself immediately evident. A decrease in the incidence of silicosis can only be expected years after the necessary measures have been taken. The lack of immediate proof of success is partly responsible for neglecting the use of available dust combating methods by the mine administration and specially by miners themselves.

In fact, ore dusts are, in most cases, much more dangerous to human lungs than coal dust alone, because coal dust itself is supposed to be less harmful than ore dusts containing quartz, mica, shales etc. Coal miners, of course, are not exposed to coal dust alone, but to a mixture of dusts, also containing the harmful minerals mentioned above. These foreign dusts are derived from the stone drivages, roof stone, stowing materials etc.

Mineral Composition

The influence of the mineral composition of air-borne dust on its capability to cause silicosis or other lung diseases has long been recognized. The Silicosis Research Institute of Bochum, Germany, has worked out a simple procedure to express in arithmetical terms the harmlessness of a dust in relation to its mineral composition. In this procedure, the air-borne dust sample is first analyzed in terms of percentage surface area of the different minerals present. It must be remembered, that the mineral composition of the rock itself is not necessarily the same as that of the air-borne dust produced by it. Fortunately, the quartz percentage in the below-10-microns fraction of an air-borne dust has generally been found to be lower than that in the rock itself. Only dust fractions below 10 microns are analyzed, since larger size particles are considered to be harmless.

The first part of this article, which is presented in two instalments, deals mainly with methods of suppression. Problems of ventilation are discussed in the second part

Each mineral has been given a certain factor, dependent on its supposed magnitude of harmfulness to human lungs. These factors have been chosen after years of observations in different mining fields having different types of mine dusts. The most common minerals present in mine dusts have been given the following factors :

Quartz	1.0
Fluorspar, mica or similar silicates	0.7, when the quartz p.c. exceeds 25 per cent 0.5, when the quartz p.c. is between 6-25 per cent 0.3, when the quartz p.c. is between 1-5 per cent 0.2, when quartz is altogether absent
Shaly substances	0.2
Carbonates and sulphates (other than those of Ca) and ore minerals in general	0.1
Ferrous oxides and hydro-oxides, coal	0.01
Ca-minerals	0.0

Although some authorities believe that Ca- minerals have a retarding effect on the contraction of silicosis, this has not yet been proved beyond doubt. Accordingly, to err on the safe side, Ca- minerals have been given a factor of zero.

Mineral Indices

The mineral index of a particular dust, indicating its harmfulness, is calculated on the basis of percentage composition of each mineral multiplied by the respective factor. Thus, the mineral index of a dust having, for example, a composition of 6 per cent quartz, 12 per cent mica, 20 per cent shaly substances, 50 per cent coal, and 12 per cent CaO, will be,

	mineral factor	
6 per cent quartz	1.0	=6.0
12 per cent mica	0.5	=6.0
20 per cent shaly substances	0.2	=4.0
50 per cent coal	0.01	=0.5
12 per cent CaO	0.0	=0.0
		Total 16.5

Since most of the ore dusts, excepting those found in potash or other salt mines, have higher percentages of quartz, mica and other harmful minerals than dusts found

in coal mines, the mineral indices of such ore dusts are correspondingly higher ; i.e., these dusts are more dangerous to human lungs.

In ore mines, the fine dust dangerous to human lungs is produced mainly during drilling, blasting, loading and tipping operations. After blasting in stopes, ore pieces too big to be mucked conveniently may have to be broken into smaller pieces by means of pneumatic hammers, which again give rise to fine dust.

Dust in Drilling Operations

By proper choice of drilling appliances, the production and dissemination of fine dusts by drilling operations may be reduced to a safe limit. Depending on the hardness and nature of the rock bored, percussive drilling may produce more or less dust than rotary drilling. Thus, before introducing any type of drilling appliance in a mine, experimental measurements should proceed to find out whether percussive drilling or rotary drilling is more suitable for the particular type of rock to be bored.

Wet bore hammers have proved to be most successful in combating dust. It should be noted, however, that only bore hammers in which the exhaust air does not come in contact with the flush water are suitable for the purpose. When exhaust air and flush water come in contact with each other, air bubbles are formed and dust particles entrapped by such air bubbles are set free in the mine air. With a bore hammer in which the air and water systems are completely independent of each other, it is possible to suppress the dust caused by drilling operators up to 97 per cent. An important precaution is to spray the face carefully with water before drilling is started. Otherwise the exhaust air of the drilling machine may whirl up the dry dust deposited on the face, and pollute the mine air.

Where it is not possible to use wet hammers owing to geological or technical reasons, dry suction filters may be used with advantage. In this case, dusts produced by drilling are sucked in a container, where they are trapped in a filter bag. The dust accumulated in such filter bags should be emptied on the surface, and care is necessary while transporting them to the surface, so as not to pollute the mine air. In a new model, water is introduced to the dust so accumulated in the container and is well mixed by a churner. The scum so produced may be emptied into any water drain underground without running the danger of polluting the mine air. Wet hammers are, of course, to be preferred to dry filters, when the conditions permit their use.

Blasting Operations

The fine dust produced by blasting may be suppressed by the use of mist projectors. It has been found, however, that only by the use of a secondary water spray, the dust bound by the fog produced by the mist projector may be suppressed satisfactorily. The amount of water necessary for the fog and the secondary water spray is rather large. The minimum volume of water required for a satisfactory suppression of dust has been found to be 1-1.5 litre per cu. metre of air. Naturally such mist projectors may be used only in drivages and development faces, and are unsuitable for stopes. Most of the blasting in a ore mine is, however, carried out in stopes.

A simpler way to combat dust caused by blasting is the use of water or CaO dust as stemming material. Their use is not restricted by any limiting factors. Recently, water cartridges made of polyethelyne have been introduced in German mines, each cartridge containing about 200 c.c. of water. One or two such cartridges in each shot-hole have proved to be adequate to suppress 60 per cent to 80 per cent of the fine dust produced by blasting.

Loading Operations

The fine dusts made air borne by loading operations may be reduced by spraying water on the ore heap to be loaded or mucked. Water has proved to be one of the best and undoubtedly cheapest dust suppressing materials. It should be used as extensively as conditions permit. The limiting factors for the use of water are its availability ; its effect on floor, roof and ore body — e.g. heaving or quilling ; and finally, the control of relative humidity of mine air. Sometimes the use of water must be minimized to avoid an undue increase in the relative humidity, which may give rise to uncomfortable working conditions. It is important to repeat the water spraying on ore heaps during loading operations at small intervals, since only the upper layer of the heap is wetted by such spraying, and dust may be raised when lower, dry layers are being loaded.

Ore chutes should be provided with water jets both at top, where ore is tipped, and at bottom, where it is drawn. The dust suppressing efficiency depends much on the type of the jet used. Only by the use of most suitable type can a high dust suppressing efficiency and a low water consumption be attained.

As far as breaking of ore by pneumatic hammers is concerned, wet hammers may be used, in which a water spray is automatically directed towards the far end of the pick, thus suppressing the dust at origin. The water and air supplies in such hammers are so coupled with each other that the air valve cannot be opened until the water supply has been turned on. The efficiencies of dust suppression of such wet hammers have been found to lie between 50 per cent to 70 per cent.

Removal of Airborne Dust

It is not possible to suppress the fine dust completely by any of the devices mentioned above. A certain amount of dust is invariably set free in the mine air and this air-borne dust must be removed from working places by means of proper ventilation. An adequate volume of ventilating air is thus important at all working places. It has been found that the relation between the dust concentration and the inverse of the air volume directed to remove the dust is lineal in normal ranges, other conditions remaining the same.

The ventilation of a coal mine is based primarily on the methane volume released by coal seams. The air volume necessary to keep the methane percentage within the permissible limit laid down by the law is in most cases large enough to remove the airborne dust satisfactorily, although the high velocities involved cause the dust to remain in suspension. Coal mine layouts are mostly simple. Thus it is not difficult to course the air properly and to minimize short circuit losses and false air currents.

In most countries, metaliferous mining laws specify a minimum volume of air, based on the total number of miners present underground, which must be coursed through the mine as a whole, although seldom more than 30 per cent to 40 per cent of the total air going down the shafts of an ore mine actually reaches working faces, the remainder flowing out of the upcast shafts without having been utilized.

Some authorities have related the volume of air needed in a mine to the amount of explosives used, by the expression (from Kamerow), $Q = 5000\ s\ b\ /\ t$, when Q = volume of air necessary in cu. metre per min., s = kg. of explosives fired in a given space of time, b = vol. of poisonous gases given out by 1 kg. of explosive, (this figure is taken as 0.1 cu. m.) and t = time in min. in which the poisonous gases must be diluted to harmless values. The expression has a very large factor of safety.

PROTECTING MINE TIMBERS WITH ORGANOTIN PRESERVATIVES

IN many mines the life of essential wooden props and timbers is extremely short because they rot so quickly in the damp conditions. Replacing them is expensive and often seriously interferes with operations.

There are few means of protecting the timber against fungus and moulds. The preservative most commonly used is creosote, but this has the disadvantage of being an inflammable oil and so increasing the fire risks. This objection does not apply to some of the organotin compounds, which have the necessary fungicidal action, but are not in themselves combustible and, by their preservative action, might well be expected to reduce the tendency of the wood to become more inflammable with age. Steps are therefore being taken to investigate the protective properties of these compounds, and to determine how they may be applied to timber.

A few years ago the Tin Research Institute put in hand trials with an organotin compound as a preservative for timbers that were placed in damp positions in three mines—the Geevor Tin Mine at Geevor near St. Ives, Cornwall, the Greenside Lead Mine near Ullswater in Cumberland and the Halkyn Lead Mine in Flintshire. In all cases the timber for treatment and the controls were obtained through the Forest Products Research Laboratory at Princes Risborough, where the impregnation with the organotin compound was also carried out at the instance of this Institute.

The treatment consisted of placing the logs in a tank filled with a hot aqueous solution of the organotin compound and allowing them to remain there overnight. Next morning, when the solution was thoroughly cold, the timbers were removed, allowed to dry, and despatched to the mines, together with precisely similar but untreated specimens.

In the mines, the timbers were used in pairs (treated and untreated) so that both were subject to the same conditions of damp and infection at points where previous experience with timber supports indicated that destruction of untreated timber would occur within about two years. The timbers were inspected periodically and left in position until there was such severe rotting in the normal logs that the blade of a sharp knife would sink deeply into them when they were stabbed. A pair of logs, one treated and the other untreated, which were removed from the Geevor mine after being exposed in a damp and mildewy situation for over three and a half years, are shown in the illustration. The treated log is still thoroughly sound except for some lengthwise cracking, which is the normal result of ageing and seasoning. The companion log that was not treated is in very poor condition; the rot has everywhere penetrated deeply, the cracks in the surface have become enlarged, one or two sizeable pieces of rotten wood have broken away, and splinters and flakes are continually falling. The untreated log would have no value as a support.

Very similar results were obtained when the specimens in the Greenside mine were examined after two and a half years. Deep fissures and crevices had formed in the untreated timber, and there was cracking across the grain; the treated timber, on the other hand, remained at full strength. A noteworthy feature of the experiment at Greenside was that the early appearance of both treated and untreated timbers was discouraging in that mould had appeared on practically all surfaces by the end of the first year. Up to that point, however, there had been no appreciable softening of the wood by rot, and it was later that the differing resistances of the timbers became apparent. After a further eighteen months, the treated timbers were still completely sound, while the untreated ones had become soft and showed the cross-grain cracking and spalling that is typical of rotted wood.

Untreated timber (left) rotted badly in 3½ years in the Geevor tin mine, Cornwall. The treated log (right) was not appreciably affected

The timbers at the Halkyn mine were examined after three and a half years. The controls and the treated timbers had been placed alternately as units of the flooring at the base of a slope, and at the time of inspection were covered by several feet of debris and loose rock. It was not practicable therefore to remove the twenty-four timbers for examination and they could only be inspected on the underside. The twelve treated specimens were all completely sound over the span of about four feet for which they were visible between their steel supports, and were little changed in appearance. Eight of the twelve untreated controls were found to be soft when stabbed, and had patches of dark fungal discoloration.

When the tests were planned, triethyltin hydroxide appeared to be the most suitable organotin compound available, because it is moderately soluble in water (an aqueous half-per cent solution was used). Unfortunately, the triethyltin compound is not available commercially—it is an unpleasant chemical to prepare and handle. The best alternatives at present available commercially are tributyltin oxide (T.B.T.O.) and triphenyltin acetate, but neither of these are sufficiently water-soluble, although both are readily soluble in organic solvents. Paraffin, kerosene and fuel oil are all good solvents.

In most of the applications of T.B.T.O. so far investigated, it has first been dissolved in an organic solvent. This solution may then be dispersed as an emulsion with water. It is possible that timber can be effectively preserved by using such an emulsion, but it must be borne in mind that the penetration and permeation of the timber fibres by an emulsion may follow a pattern very different from that of an aqueous solution. In order to compensate for this difference, the impregnation with T.B.T.O. emulsion might best be carried out on dried or seasoned timber in which the fissures and cracks incidental to seasoning have already appeared.

The effect of triethyltin hydroxide on the experimental timbers used in the three English mines mentioned above suggests that it would certainly be worthwhile to investigate the value of emulsions of tributyltin oxide as preservatives for mine timbers.

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MINING MISCELLANY

According to the Czech official news agency, it was decided at a meeting held in Sofia recently of Comecon (a mutual economic aid and group planning body of the Eastern European Communist countries, excluding Yugoslavia), that production of ferro-nickel ores in Albania and of iron ore in Bulgaria should be increased. Group co-operation would assist this increase in production, as well as help raise output of certain non-ferrous metals. At the same meeting it was decided that Czechoslovakia should ensure the supply of plant and machinery to the basic industries of other Comecon countries, concentrating particularly on the production of coke and coal; in return for this, Czechoslovakia was guaranteed supplies of agricultural produce from the neighbouring countries.

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Acceding to a request of the Association of German Potash Producers, the Federal German Cartel Authority has announced that it will allow the registration of a general cartel for the country's potash industry. The validity of the cartel expires unless it is further renewed on December 31, 1962. The cartel agreement provides for the sales of all West German potassium salts through a central body, to be called Verkaufsgemeinschaft Deutscher Kaliwerke G.m.b.H., which is based in Hanover.

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The Soviet Union have been urging, by radio and Press, that use of copper, nickel, tin, lead and brass should be as economical as possible. Although production of these and similar metals is to be increased by two or three fold in the next seven years, the demand has risen so considerably in recent months that bottlenecks are reported.

Substantial deposits of thorium ore were recently found on Capure Island, Delta Amacuro Federal Territory, on the southern shores of the Gulf of Paria, Eastern Venezuela. Thorium has never before been found in such large quantities in Venezuela, and its exploitation is now being studied.

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The first shipment of manganese ore from the Perene region of eastern Peru reached Lima at the beginning of November last, as part of a 500 tons order of 57 per cent manganese ore, bought by W. R. Grace & Co., who have a further option on 200,000 tons of manganese from this region. The price was fixed at 1,100 soles a ton for 57 per cent ore, with a premium of 50 soles for every point above 57 per cent.

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It is reported from Kashmir that the government of Jammu and Kashmir has set up a mining corporation with a capital of Rs.50,000,000, which might be increased sixfold.

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The government of Mysore has sanctioned a development scheme estimated to cost Rs.2,000,000, to mine high grade ores in the Nundydroog Mines of the Kolar Gold Fields. Under this scheme, it is proposed to sink a shaft from the 2,000 ft. level to 3,700 ft.

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Within the next six months a subsidiary of Falconbridge Nickel is to erect a pilot plant for the extraction of nickel from the Cibao region of the Dominican Republic. Surveys have indicated that ore reserves in the area total some 100,000,000 tons, and large scale production is planned within two years.

Ruston-Bucyrus of Lincoln have just received an order for three of their 110-RB electric shovels with Ward-Leonard control. These shovels are of 4½ cu. yd. capacity and will be used for excavating limestone for cement manufacture by Skanska Cement A/B, Sweden, who already operate two similar 110-RB shovels. The value of this export order is approximately £180,000

It is learned from official sources in Ottawa that a committee of four Cabinet Ministers has been formed to advise on various proposals for stabilizing the Canadian uranium industry.

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Plans for a multi-million dollar manganese mining operation in San Juan County mining district, were announced recently by Standard Uranium Corporation of America. Mr. Russell Wood, assistant general manager of Standard Uranium announced that nearly $1,000,000 has already been spent by the firm on development of the project, which calls for the overall expenditure of nearly $8,000,000. Mr. Wood added that the plan specifically calls for the construction during 1961 of a $6,704,000 refining plant on the western slope, and expansion of the company's ore concentration plant at Silverton to upgrade manganese-bearing rhodonite ore from the area. The company hopes to produce 116,000 tons of rhodonite concentrate and 40,225 tons of manganese annually, which would require a daily production of 1,500 tons of crude ore.

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Surveys into mineral deposits in the East Indies are planned during 1960. Exploration for iron ore will be conducted in Kalimantan and on Flores Island, for asbestos on Halmahera Island in the Moluccas, and for copper, lead and zinc deposits in Tjirobon, West Java. Previous surveys have established the presence of mercury deposits with good prospects for exploitation in West Kalimantan. The planned surveys will be conducted by foreign experts made available under the Colombo Plan, by International Co-operation Administration and by the Japanese Government.

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The Kariba Dam project has been supplying power commercially to the Northern Rhodesia Copperbelt since January 1, exactly on schedule. Announcing this, the Federal Minister of Power, Sir Malcolm Barrow added that the supply may be interrupted from time to time during the next few weeks for final adjustment of ancillary equipment. Power from the Kariba will flow to Salisbury in May, then to the Electricity Supply Commission at Sherwood near Que Que and Lusaka in October next, with Bulawayo receiving electricity five months later.

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The U.S. Government has decided not to proceed at this time with an annual survey of mineral industries proposed last year by the Bureau of the Census and the Bureau of Mines. Mr. Lesinski, chairman of the House Post Office and Civil Service Subcommittee on Census and Government Statistics, announcing this decision, said that the government would for the moment prefer the simpler scheme of asking questions in conjunction with reports regularly filed on a voluntary basis with the Bureau of Mines. This method, which was also approved by the American Mining Congress, was considered less costly, and less likely to lead to undue duplication of existing reports.

The Cameroons' Mining Board have announced the discovery of a bauxite deposit of good quality and considerable reserves in the Province of Adamoua, North Cameroons, 500 km. from the coast.

★

The Canadian Government has marked the 100th anniversary of Saskatchewan's prospectors assistance plan, by adding even more services to this plan, which has already flown about 150 prospectors into the north, free of charge, dropped them supplies every month, given them free advice by experts and brought them out at the end of the season. The plan has cost the C.C.F. Government about $50,000.

★

Final development of extensive beryllium deposits in the Sheeprock Mountains of Western Utah, U.S., held by Ranrex Oil and Mining Co., will be undertaken in the near future by Hamlin Exploration and Mining. The deposist are claimed by the two firms to hold proved reserves of 3,000,000 tons of commercial grade beryllium ore, and it is thought that present work will boost reserves to more than 5,000,000 tons.

★

Queen's New Year Honours.—Knighthoods have been conferred on: Mr. Joseph Latham, deputy chairman, National Coal Board; Mr. Ronald P. Morison, Q.C., Independent Chairman, Executive Committee, British Iron and Steel Federation. Mr. H. T. Ramsay, Director, Safety in Mines Research Establishment, Ministry of Power, has received the C.B.E. O.B.E. awards include: Mr. D. E. Macinnis, director of Dept. of Lands, Surveys and Mines, Territory of Papua and New Guinea; Mr. J. S. Hales, Dir., Industrial and Domestic Development Laboratory, British Coal Utilization Research Association; Mr. P. M. Holman, of Holman Bros., Chairman, Cornwall District Advisory Committee; and Mr. E. S. Newson, Joint General Manager, British Africa Co.

★

Nickel Mining and Smelting Co., and Faraday Uranium Mines have signed a contract involving $4,400,000, designed to give Ontario another nickel-producing mine by the end of 1961. Of the sum involved, $800,000 is to be provided through the purchase by Faraday of Nickel Mining shares. The $3,600,000 balance would be in the form of bonds with stock purchase warrants attached. Faraday's earnings from its Bancroft uranium mine are more than sufficient to guarantee the amount needed by Nickel Mining. Operating profits this year have averaged $350,000 a month, and these are expected to be substantially improved this month and for some time to come by the recent discovery of higher grade ore on its property. (See *The Mining Journal*, January 1, p. 19).

★

The Directorate of Overseas Surveys has commissioned two aerial photographic contracts in Nigeria and Sierra Leone involving an area of 18,000 sq. miles. Two aircraft will be used, and work has already begun on the survey by the Aircraft Operating Co. of Johannesburg, the South African associate of Hunting Survey Group.

Coming Events

The American Mining Congress will be holding their annual Coal Convention in Pittsburgh, Pa., on May 9-11, and reservations are now being made by those wishing to attend.

★

Manchester Geological and Mining Society will be meeting at the Wigan Mining and Technical College, February 11, at 4 p.m., for a lecture by J. G. Hind on "Experiments with roadway supports".

★

The Midlands Counties Institution of Engineers will be meeting at the University, Nottingham, on January 20, at 4.30 p.m., for a lecture by C. V. Peake, on "The development of an experimental ripping machine". A further meeting will be held at Mansfield Woodhouse Mines Rescue Station on February 17, at 6.30 p.m. for a lecture by P. L .Collinson on "Proving coal reserves in the Nottinghamshire and North Derbyshire coalfield".

★

The Midland Institute of Mining Engineers will meet at Danum Hotel, Doncaster, February 4, at 2.30 p.m., for a lecture by R. Shepherd on "The measurement of strain in concrete shaft and roadway linings".

★

The North of England Institute of Mining and Mechanical Engineers will meet at The Institute, Neville Hall, Newcastle upon Tyne on February 6, at 2.30 p.m. for a lecture by J. D. Jenkins and I. Storey on "Prop-load measurements underground".

★

The North Staffordshire Institute of Mining Engineers will meet at the North Staffs. Technical College, Stoke-on-Trent, on February 1, at 5.30 p.m., for a lecture by C. M. Harmer on "Coal ploughability".

★

The South Staffordshire and Warwickshire Institute of Mining Engineers will meet at the Swan Hotel, Lichfield, on February 16, at 3 p.m., for a lecture by A. J. Hughes and W. E. Raybould on "The rapid determination of the explosibility of mine-fire gases".

★

The South Wales Institute of Engineers will meet at The Institute, Park Place, Cardiff, on February 18, at 6 p.m., for the 22nd William Menelaus Memorial Lecture, to be delivered by Dr. Thomas E. Allibone, entitled "Nuclear energy from fission and fusion reactions".

★

The Southern Counties Institute of Mining Engineers, will meet at 3 Grosvenor Crescent, London, on February 12, at 3.30 p.m., for a lecture by Dr. A. Latin on "The contribution of metallurgy to the coal-mining industry".

Company News

A new company, Willis Instruments Ltd., has been formed in the West of Scotland to manufacture gas detecting instruments and alarms to certified and approved designs, and to provide day and night servicing and maintenance facilities for all types of electrical and electronic and scientific instruments.

★

Sulmac Exploration Services of Canada announce that they are forming an association with Velocity Surveys of Alberta, who have been conducting seismic and associated surveys of the oil industries.

★

As from January 18, all sections of the Overseas Geological Surveys at present housed in the Commonwealth Institute Building will be moving to: 64-78 Gray's Inn Road, London, W.C.1. (Tel.: CHAncery 4531), to which all communications should be addressed. The Photogeological Section of the Overseas Geological Surveys will remain at the Directorate of Overseas Surveys, Kingston Road, Tolworth, Surbiton, Surrey

★

The Hunting Survey Group have announced the following changes of name, as from January 1, in order to simplify and streamline the structure of certain British and Canadian companies: in Britain, the activities of Hunting Geophysics Ltd. have been merged with those of Hunting Aerosurveys, Ltd., and the name of the new combined company will be Hunting Surveys Ltd. The two other companies in the British division of the Hunting Survey Group, Hunting Technical Services, Ltd., and Aerofilms Ltd., will continue to work in close association with Hunting Surveys Ltd. In Canada, the activities of The Photographic Survey Corporation Ltd., Hunting Airborne Geophysics Ltd., and Hunting Technical and Exploration Services Ltd., have been combined under the name of Hunting Survey Corporation Ltd.

★

A Swedish order worth £180,000 has been received by Ruston-Bucyrus for three 110-RB electric shovels with Ward-Leonard control. Of 4½ cu. yd. capacity, they will be used for excavating limestone for cement manufacture by Skanska Cement A/B.

Personal

The Hadfields Group of Companies announce that, with effect from December 31, 1959, Mr. T. H. Arnold will relinquish his appointments as local director and controller of the Research Department at his own request, and also his directorship of Hadfields Steels and Hadfields Forgings. Mr. L. G. Finch, has been appointed local director and controller, Research Department, and Mr. J. A. Grainger will be deputy research controller.

★

Associated Electrical Industries have appointed Mr. Stanley White as chief Press officer.

★

Mr. Robert A. Almond has been taken into partnership with Philipp and Lion, as from January 1.

Metals and Minerals

An Eventful Year for Silver

For the silver market the year 1959 has been unusually, and sometimes unpleasantly, eventful, report Mocatta and Goldsmid Ltd. in their annual circular. There was a bigger domestic demand for silver in London during 1959 than in any year since the war. With industrial activity maintained as it has been, some increase in the demand for silver was to be expected, but the event has outstripped any reasonable forecast. Mocatta and Goldsmid estimate that silver consumption in Britain in 1959 will turn out to have been about 17,500,000 oz. — a rise of about 30 per cent over the total for 1958.

This large domestic demand pushed up prices in London above those which obtained on the Continent. This situation is also reflected in the figures for U.K. imports and exports. For the first eleven months of the year imports were well above those of last year, and to them must be added about 4,500,000 oz. of Australian silver which, being imported in the form of lead bullion, do not enter into the silver statistics. Exports, on the other hand, were lower by 25 per cent.

In the first quarter, the disconcerting tactics of the French Mint increased, for a time, the uneasiness of the market, with massive purchases for minting the new coinage. The French Mint then withdrew from the market and remained content with such parcels as could be bought at prices which seemed favourable.

The last quarter of the year was marked by a shortage of supplies, amounting almost to a silver famine, due to strikes in most of the larger American refineries which were finally settled in mid-December. As a result, the Canadian Mint placed buying orders for silver in London for the first time on record and bought 1,000,000 oz. Until the effects of the strikes have been fully overtaken, a continued world shortage of spot silver can be expected. The London price might then settle down on the parity of American silver delivered in Europe, if no other major disturbances ensue.

The amount of silver obtained in 1959 from demonetized U.K. coin is believed to have been about 7,000,000 oz., but about a quarter of this has not yet been offered for sale. For a period in the summer, this source of supply dried up altogether. The market has more reason than perhaps it knows, comment Mocatta and Goldsmid, for being grateful to the Authorities for their readiness not only to stand by in moments of unusual stress but, on occasion, to modify their own programmes for the sake of maintaining an orderly market in London.

LONDON METAL AND ORE PRICES, JAN. 7, 1960

METAL PRICES

Aluminium, 99.5%, £180/£186 per ton
Antimony—
English (99%) delivered, 10 cwt. and over £190 per ton
Arsenic, £400 per ton
Bismuth (min. 1 ton lots) 16s. lb. nom.
Cadmium 10s. 0d lb.
Cerium (99%) net, £16 0s. lb. delivered U.K.
Chromium, Cr. 99% 6s. 11d./7s. 4d. lb.
Cobalt, 14s. lb.
Germanium, 99.99%, Ge. kilo lots 2s. 5d. per gram
Gold, 250s. 7d.
Iridium, £23/£25 oz. nom.
Lanthanum (98%/99%) 15s. per gram.
Manganese Metal (96%/98%) £245/£250
Magnesium, 2s. 2½d./2s. 3d. lb.
Nickel, 99.5% (home trade) £600 per ton
Osmium, £21/£23 oz. nom.
Osmiridium, nom.
Palladium, £8 12s. 6d.
Platinum U.K. and Empire Refined £28 10s. oz.
Imported £27/£27½
Quicksilver, £71½/£72 ex-warehouse
Rhodium, £41/£45 oz.
Ruthenium, £18/£20 oz. nom.
Selenium, 50s. 0d. per lb.
Silver, 80¼d. f. oz. spot and 79½d. f'd
Tellurium, 21s. 6d. lb.

ORES AND OXIDES

Antimony Ore (60%) basis	20s. 0d./22s. 0d. per unit, c.i.f.
Beryl (min. 10 per cent BeO)	250s. per l. ton unit BeO
Bismuth	65% 8s. 6d. lb. c.i.f. 18-20% 1s. 3d. lb. c.i.f.
Chrome Ore—	
Rhodesian Metallurgical (semifriable 48% (Ratio 3 : 1)	£15 15s. 0d. per ton c.i.f.
" Hard Lumpy 45% (Ratio 3 : 1)	£15 10s. 0d. per ton c.i.f.
" Refractory 40%	£11 0s. 0d. per ton c.i.f.
" Smalls 44% (Ratio 3 : 1)	£14 0s. 0d. per ton c.i.f.
Baluchistan 48% (Ratio 3 : 1)	£11 15s. 0d. per ton f.o.b.
Columbite, Nigerian quality, basis 70% combined pentoxides (Ratio 10 : 1). Nb_2O_5:Ta_2O_5	175s. per l. ton unit c.i.f.
Fluorspar—	
Acid Grade, Flotated Material	£22 13s. 3d. per ton ex. works
Metallurgical (75/80% CaF_2)	156s. 0d. ex. works
Lithium Ore—	
Petalite min. 3½% Li_2O	40s. 0d./45s. 0d. per unit f.o.b. Beira
Lepidolite min. 3½% Li_2O	40s. 0d./45s. 0d. per unit f.o.b. Beira
Amblygonite basis 7% Li_2O	£25 0s. per ton f.o.b. Beira
Magnesite, ground calcined	£28 0s./£30 0s. d/d
Magnesite Raw (ground)	£21 0s./£23 0s. d/d
Manganese Ore Indian—	
Europe (46%-48%) basis 6/7s. 6d. freight	73d./75d. c.i.f. nom.
Manganese Ore (43%-45%)	69d./71d. c.i.f. nom.
Manganese Ore (38%-40%)	nom.
Molybdenite (85%) basis	8s. 11d. per lb. (f.o.b.)
Titanium Ore—	
Rutile 95/97% TiO_2 (prompt delivery)	£29 per ton c.i.f. Aust'n.
Ilmenite 52/54% TiO_2	£11 10s. per ton c.i.f. Malayan
Wolfram and Scheelite (65%)	150s. 0d./153s. 6d. per unit c.i.f.
Vanadium—	
Fused oxide 95% V_2O_5	8s./8s. 11d. per lb. V_2O_5 c.i.f.
Zircon Sand (Australian) 65-66% ZrO_2	£16/£16 10s. ton c.i.f.

HIGHER GOLD TURNOVER

On the subject of gold, Mocatta and Goldsmit report that during 1959 the turnover in London increased appreciably. When the external convertability of sterling was restored at the end of 1958, one incidental consequence was that the London gold market became free to compete again on equal terms. Business which had been deflected from London because other markets were able to deal against transferable sterling began to return to its natural and traditional centre. Full use of the facilities available in London was further assisted when, as from March 20, the market received permission to deal for a forward date without previous reference to the Bank of England. For all practical purposes, the market is now as free and open as it was before the war, except for the restrictions which still prevent residents within the scheduled territories from holding or dealing in gold.

In a number of leading countries abroad, similar restrictions have been entirely removed, with the result that gold can almost be said to have become, once again, an international commodity freely exchangeable in the world market.

The world's appetite for gold in one form or another (apart from the official demands for monetary use) seems undiminished. South Africa thought it worthwhile to make a new departure in April, 1959, by offering to sell bars to private purchasers direct, and several schemes were launched for selling gold certificates to the public. However, the purchase of the actual metal, or the option to purchase, remained considerably cheaper. Some part of the private demand for gold or its equivalent is attributed to the persistent or recurrent belief that, sooner or later, the price of gold must be brought into closer conformity with the general rise of other prices throughout the world.

Among the uncertain factors continues to be the influence of Russian sales. For the first time an accurate assessment of the quantity of refined gold arriving in London from Russia is obtainable, this being given as 7,291,734 oz. in the first 11 months of 1959.

MAGNESIUM PRICE INCREASE

As from January 1, 1960, Alcan (U.K.) Ltd. have raised their price for primary magnesium in 20-lb. ingots of 99.8 per cent minimum purity to 2s. 2½d. per lb. delivered customer's works in the U.K. This represents an increase of 2½d. per lb. The company's prices for commercial die-casting alloy and for 20-lb. ingots of primary magnesium of 99.9 per cent minimum purity remain unchanged at 2s. and 2s. 3d. per lb. respectively.

★

A shipment last month of 34,000 lb. of primary metal from Alabama to a fabricating plant in Ohio represents the first movement into the commercial market of magnesium produced by the U.S. industry's second and newest producing

company, the Alabama Metallurgical Corporation (Alamet). Owned jointly by Brooks and Perkins and Calumet and Hecla, the new company is operating recently completed facilities at Selma. January 1 was the scheduled date for the Selma plant to go into full operation. The plant is designed for an output of approximately 7,000 tons annually.

★

U.S. production of primary magnesium for 1959 is currently estimated at 30,000 s.tons, being virtually unchanged from 1958. No plan for expanding its production rate further in the near future has been announced by Dow, but Alamet's announced schedule indicates a total U.S. production in 1960 of at least 35,000 tons and possibly more. Demand and consumption are expected to continue rising in 1960, shipments of primary metal to consumers reaching at least 45,000 tons.

RUSSIAN DIAMONDS

The economic council of Yakutia, in Eastern Siberia, has worked out plans for the development of two major diamond centres, reports *Soviet News*. The first of these is being built round the Mir kimberlite pipe, which was discovered in 1955 and is already yielding large quantities of diamonds. Its enterprises will reach full capacity within the next five or six years. The second centre will be built round the Udachnaya kimberlite pipe, which is to be fully developed by 1970.

Diamond production in the Soviet Union is scheduled to increase 16-fold by 1965, as compared with 1958, and it is stated that this will largely meet the country's domestic requirements.

At the Mir pipe an opencast working and a kimberlite ore mine are already in operation, states the report, as well as crushing installations and two diamond-extracting plants. Mirny, the diamond workers' town, now has a population of 10,000. Similar developments will take place in the area of the Udachnaya pipe. A hydro-electric station is to be built on the River Vilpui, a tributary of the Lena, to supply the diamond areas with power, and its first section will start producing current in 1964.

At the end of 1959 *Tass* reported the discovery of a new rich diamond deposit on the upper reaches of the Visher river in the Northern Urals. Development of the deposit, according to *Tass*, will increase diamond production in the Urals at least ten-fold. It is further stated that Ural diamonds are used in the jewellery industry.

COPPER · TIN · LEAD · ZINC

(From Our London Metal Exchange Correspondent)

With the Exchange shut on New Year's Day and works still preoccupied with end of year stock-taking, activity has been on a modest scale but, in spite of this, the undertone of all the markets remains firm and changes in prices have been in an upward direction helped by the settlement of the U.S. steel strike; it is expected that as commercial activity increases towards the middle of the month, both the turnover and price level on the Exchange will benefit.

UPWARD TREND IN FORWARD COPPER

The copper situation remains virtually unchanged from last week as those negotiations which are taking place in the U.S. between the Metal Companies and the Mine Mill Union have made little progress. The settlement of the U.S. steel strike may make a settlement in the copper industry more difficult, since preliminary reports indicate that the base of settlement is very much higher than the approximately 22½ c. an hour which has formed the basis of those agreements in the copper industry already negotiated.

Whatever happens, physical copper is going to remain short for many weeks to come and the behaviour of the forward quotations on both the L.M.E. and Comex indicates that the fear of a rapid collapse in the price has passed: on both markets the backwardation shows a tendency to narrow with the "spot" quotations falling and "forward" quotations rising. Stocks in official warehouses in the U.K. showed a small fall of 125 tons to 5,372 tons and it is believed that a small tonnage of physical copper has become available to ease the technical position in January. New business has been on a modest scale and the majority of the turnover has consisted of profit-taking sales of nearby metal and of postponements of maturing contracts, which latter operation has found sellers of forward metal reticent.

The U.S. Copper and Brass Research Association has predicted that there will be no shortage of copper in the decade ahead and that in the near future the indications were that brass mill output would rise 5 per cent in 1960 and that U.S. production of refined copper should reach some 1,500,000 tons this year. A little bit further forward it predicted a rise in the Free-World production from about 3,860,000 tons in 1959 to 4,369,000 tons in 1963.

One small item of news which is of great interest to the copper world is the report that power from the Kariba Dam has commenced to flow to the Northern Rhodesian Copperbelt.

China's National Metals Import Corporation has placed a record order for copper rods with leading British rod rolling firms. Valued at £18,000,000, the order is being split among five British concerns, and delivery is to be completed this year. The firms in question are: B.I.C.C., Enfield Rolling Mills, Richard Johnson and Nephew, Pirelli's and Frederick Smith and Co.

U.S. STEEL SETTLEMENT HELPS TIN

The tin market has been helped by the settlement of the U.S. steel strike and by the fact that offerings in Singapore have not shown any material increase with the commencement of the new quarter. The price has firmed up in London and the backwardation has shown signs of increasing, although stocks in official warehouses showed an increase at the beginning of the week of 166 tons at a total of 8,693 tons.

Also during the period under review estimates have been published by a leading tin broker that, based on the present export quotas, there is likely to be a surplus of tin supplies in 1960 of some 14,000 tons. This estimate is generally accepted in principle and, should it prove correct, may cause the International Tin Council some embarrassment before the end of the year, as a cutback in the export quota may become necessary and might have to be quite severe, if policy dictates that the holdings by the Buffer Stock Manager should be run down towards the end of the present agreement which expires mid-1961.

During December 8½ tons of tin were shipped from Singapore compared with 7 tons in November, and 3,763 tons were shipped from Penang compared with 4,231 tons during the previous month and only 1,733 tons a year ago. As during November, a small tonnage came to Europe and the U.K. with the majority being shipped to the U.S., Japan, India and South America.

On Thursday the Eastern price was equivalent to £790⅜ per ton c.i.f. Europe.

LEAD/ZINC STUDY GROUP TO MEET

The only definite news affecting the lead and zinc markets is that the Study Group of the United Nations will meet in Geneva on January 27, presumably to make recommendations to a full meeting of the countries concerned which will probably take place in New York late in the Spring. The markets in London have remained firm with the backwardation in lead tending to increase and that in zinc being maintained at its previous high level. At the moment there seems little relief in sight and it is generally expected that the lead price will continue to firm up, whilst the zinc price will remain steady at the present levels. Consumer demand for lead can be classed as satisfactory, whilst that for zinc remains active especially for the higher grades.

Closing prices are as follows:

	Dec. 31		Jan. 7	
	Buyers	*Sellers*	*Buyers*	*Sellers*
COPPER				
Cash	£255	£255½	£253½	£254
Three months ..	£239¾	£240	£243¼	£243½
Settlement ..	£255½		£254	
Week's turnover	15,975 tons		9,650 tons	
LEAD				
Current ½ month	£73½	£74	£74½	£74½
Three months ..	£73½	£73½	£73⅞	£74
Week's turnover	15,675 tons		6,950 tons	
TIN				
Cash	£785	£785½	£793½	£794
Three months ..	£782	£782½	£785	£785½
Settlement ..	£785½		£794	
Week's turnover	875 tons		705 tons	
ZINC				
Current ½ month	£94½	£94½	£95½	£95½
Three months ..	£89¼	£90	£90½	£90½
Week's turnover	9,850 tons		5,500 tons	

Mining Finance

Jackpot Year for F.S.G. and Holdings ?

By any standards, 1959 was a remarkable year for the O.F.S. gold field. It saw the world shaft sinking record transferred to the hands of President Steyn ; development values improved almost throughout the length of the field, including some extraordinary values at F.S.G. last January ; and expansion plans at many of the mines were helped ahead by the unprecedented level of native labour availability, which, indeed, proved almost an embarrassment at some producers. All this took place against a background of steadily improving grades and profits. And, as an indication that the field is now well and truly out of its adolescence, two companies, President Brand and Western Holdings, have joined the ranks of the taxpayers.

Yet it may well be that this time next year, 1959's achievements may appear quite small beer compared with what can be confidently expected for 1960. Especially is this so for the joint O.F.S. market leaders, Free State Geduld and Western Holdings. Both companies have now published their annual reports, and both give grounds for considerable optimism regarding the immediate future.

Probably the most important influence on 1960 operations at these two producers is one which is common to both : the area of extreme enrichment which is likely to lie on the boundary between the two lease areas. Although the evidence for this rich area has been in existence for a decade in the shape of the two famous boreholes G.D.1 and G.D.2, both mines have refrained from attacking this area until it became necessary in the normal course of mining.

It now appears, however, that both Holdings and F.S.G. are going to explore the boundary area before the current financial year ends. Should the work show that the enriched area is as extensive as is generally thought, the impact on the companies' shares will be strong indeed.

For F.S.G., the year will also be marked by further exploration of the secondary "jackpot" south of No. 1 shaft. From this area came the results which set the market alight in the early days of 1959. Meanwhile, the grade recovered will reflect the high development values of the past year, providing the wherewithal for further increases in the rate of dividend distributions.

Western Holdings has no secondary jackpots ; but just as important are the plans announced for this mine's further expansion. From its present nominal capacity of 150,000 tons per month, the plant is to be extended to treat 175,000 tons, the additional capacity becoming available towards the end of the current financial year. Although the impact of this will probably not become apparent until well into 1961, throughput still has considerable leeway to make up on the present capacity. Given a continuing good supply of African labour, therefore, tonnages will go on rising, especially since ore is now becoming available from the No. 3 shaft area, where stoping began three months ago.

The reports from President Brand, President Steyn and Welkom will be discussed next week.

KLERKSDORP CONS. TURNED DOWN AGAIN

Klerksdorp Consolidated Goldfields has been frustrated in its attempts to become a scheduled uranium producer.

The latest of a long series of applications was made at the end of September. In reply, the Minister of Mines has said that the surplus of uranium in the Union precludes him from accepting Klerksdorp's application.

Klerksdorp Consolidated shareholders will be all the more disappointed on this occasion, because the company has devoted great efforts to showing that its ore can be treated by new methods involving a considerably lower capital expenditure than is usual in South Africa. The chairman had already indicated, however, that the prospect for this latest application was not hopeful, though the authorities were sympathetic.

NEW PEAK IN DIAMOND SALES

As had been widely expected, the total of diamond sales for 1959 has reached a new record level at £91,135,943. The previous record was set up in 1957, when stones to a value of £76,772,112 were sold.

Sales in the last quarter of 1959 actually showed a slight decline from the previous quarter's high level. This was mainly attributable to a fall in gem sales from £16,891,253 to £15,465,301. In spite of competition from the General Electric Company's synthetic material, industrial sales improved by almost £1,000,000 to reach £7,263,795, making a total for the quarter of £22,729,000, compared with £23,208,000 in the September three months.

RAND AND O.F.S. RETURNS FOR DECEMBER

The Christmas holiday had the expected effect on the returns from the South African Gold mines for what may or may not have been the last month of the fifties. Tonnages were generally down in comparison with November, and profits, in spite of an increase of 4d. in the gold price basis, mostly followed suit.

The one big exception was Western Holdings, where as if to celebrate the publication of its excellent report for 1958-9, a best-ever profit of £762,960 was earned. This was £38,500 higher than the November figure. An increase of .3 dwt. in grade combined with a throughput 2,000 tons up and costs 2d. per ton down to give this excellent result.

Elsewhere, there were record earnings by several other young producers, including Free State Geduld (where grade and costs

LONDON MARKET HIGHLIGHTS

While the shine faded from industrial share markets, the South African gold section kept remarkably firm during the first half of the week. Later, Kaffir prices began to succumb to the prevailing dullness but the tone of the market remained sound.

Earlier, the Cape had provided active support for Welkom and the shares reached 24s. 6d. before reacting to 24s. There was again talk of high gold values in the December quarterly report now imminent, while the mine's annual report spoke encouragingly of plans to draw ore from the promising south-western corner of the property in a few month's time.

Record profits in December for Western Holdings contrasted sharply with the generally lower trend of earnings in that month which resulted from the Christmas holiday. Holdings consequently advanced to a best-ever £9 a share and there was some switching into them from F.S. Geduld (188s. 1¼d.) ; although the latter's report focussed attention on outstandingly high gold values in this rich mine's extreme south-western corner.

West Driefontein moved sharply ahead to 212s. 6d. and Western Deep were also a firm market at 58s. 6d. on Cape buying. Among the few really dull spots at midweek were Hartebeest (57s. 6d.) and St. Helena (79s.), due in each case to some apprehensions as to what would be contained in their coming quarterly reports.

"Freddies" moved up to 8s. 4¼d. on a persistent Cape demand that was not discouraged by the news that their GZ1 borehole in the extreme north of the O.F.S. had failed to find the reef.

Finance issues made a good showing for a while under the stimulus of both Cape and London investment demand. In Diamonds, De Beers were particularly firm at 194s. 4½d. in front of the record sales figures for 1959 ; some doubt was felt, however, as to whether this performance could be equalled in the current year in face of the growing competition from synthetic stones.

Copper shares started the week firmly, but later began to fall back. Rhokana at 75s. 7½d. "ex" the nine-for-one scrip issue showed a fall of 3s. Chartered came back to 115s. 7½d. after having been at a new peak of 119s. 6d.

Speculative buyers continued to come forward for Rhodesia-Katanga and the shares rose to 16s. 3d. before reacting to 15s. when the demand was filled. Against the trend "Tanks" moved ahead to 47s. 6d. ; the company derives its revenue from a big shareholding in the Belgian Congo copper producer, Union Miniere, which reported a record output for 1959.

Tin shares moved irregularly, but there were signs that the market was feeling more confident that the increased output quotas would be fairly well absorbed by the metal market. Bisichi climbed to 6s. when attention was drawn to the prospect of sharply rising earnings this year from their tin and columbite production.

Lead-zinc shares moved into forward gear. There was a feeling that at last it was the turn of these two metals to benefit from a recovery. New Broken Hill rose to 40s. 6d. and North Broken Hill were four shillings up at 112s. 6d.

both improved to offset a decline in tonnage), West Drie, Buffels and Winkelhaak. At this last mine, tonnage was very sharply up — by 10,000 tons, in fact — in comparison with November, when a strike underground interfered with production.

There were special circumstances at work in the poorer results from President Steyn, Rand Leases, Robinson Deep and City Deep. At Steyn, the recent gas explosion must have caused the decline in tonnage milled from 104,000 to 99,000, although there was no explicit qualification to the mine's return. Rand Leases' profits were seriously affected by a breakdown of the main rock winder motor, and the drop in earnings at City Deep was the result of a pressure burst in the No. 5 shaft. At Robinson, an unexpected decline in grade has temporarily affected profits.

Our usual table of gold and uranium outputs and profits appears opposite.

Financial News and Results

Freddies' Drill Finds Fault.—Free State Development and Investment Corporation has announced that borehole G.Z.1. in the Viljoenskroom district of the O.F.S., which is being drilled jointly with Western Holdings, missed the Vaal Reef owing to displacement by a fault. Deflections are being carried out.

Lake George Results.—Operations of Lake George Mining Corporation resulted in a net group loss on consolidated account of £5,462 after all charges. The operating subsidiary earned a mining profit of £141,765, but this was eaten up by depreciation, tax, and retentions by the subsidiary. Last year's overall result was identical. Meeting, January 12.

Leslie and Bracken Issues.—The recent flotations of Bracken Mines and Leslie Gold Mines were both extremely successful. In each case 1,480,000 shares of 10s. were offered at par to shareholders of Union Corporation and Winkelhaak Mines, and in each case 98.4 per cent were subscribed.

Coronation Syndicate Buys a Colliery.—At the annual meeting of Coronation Syndicate, Mr. S. F. Dench revealed that Coronation Syndicate had exercised an option to purchase the whole of the share capital of the Riversdale Anthracite Colliery (Pty.). The take-over became effective on December 31. Riversdale produces about 1,800 tons of anthracite coal per month.

Sallies Coming Issue.—At the E.G.M. of S.A. Land and Exploration three weeks ago, the resolutions regarding the proposed issue of notes were passed without modification. The notes will be offered in the ratio of £4 of notes for every 5 shares held, the offer remaining open from Jan. 11, 1960 to Feb. 1, 1960.

Brakpan and Springs Capital Returns.—The court orders, in terms of which Brakpan and Springs Mines were permitted to reduce their respective capitals, were registered by the registrar on December 31. A return of 6d. per share will be made by each company in February to shareholders of record on December 31.

McIntyre Porcupine Share Split.—At a special meeting of McIntyre Porcupine Mines, a resolution was passed authorizing an application for letters patent providing for the subdivision of the company's shares on a three-for-one basis.

Rand and Orange Free State Returns for December

GOLD OUTPUT AND PROFIT

Company	December 1959 Tons (000)	Yield (oz.)	Profit† (£000)	Year ends	Current Financial Year Total to date Tons (000)	Yield (oz.)	Profit† (£000)	Last Financial Year Total to date Tons (000)	Yield (oz.)	Profit† (£000)
Gold Fields										
Doornfontein	93	38,032	185·6	J	567	230,495	1137·8	525	219,249	1153·2
Libanon	110	25,739	60·0	J	663	155,674	370·0	588	138,690	326·5
Luipaards Vlei	68	11,964	3·4	J	428	75,611	32·1	420	72,350	32·9
Rietfontein	16	4,247	7·6	D	192	50,910	91·2	250	58,411	143·4
Robinson	50	9,000	L29·0	D	686	140,812	L114·2	863	181,961	6·9
Simmer & Jack	73	13,704	L21·1	D	1,005	192,334	L59·0	1,059	201,787	163·9
Sub Nigel	64	15,088	15·7	J	394	93,673	120·0	397	95,782	151·6
Venterspost	121	31,194	58·3	J	755	190,954	364·9	769	191,016	353·2
Vlakfontein	50	17,913	83·7	D	609	218,553	1033·9	596	210,605	1019·3
Vogels	87	18,732	20·3	D	1,091	242,678	401·0	1,141	254,863	529·6
West Drie	110	100,657	852·3	J	625	571,932	4802·1	482	460,472	3769·2
Anglo American										
Brakpan	143	17,292	13·2	D	1,672	202,677	139·5	1,492	198,620	142·4
Daggas	219	44,467	214·5	D	2,850	573,963	2801·6	2,785	577,156	3033·6
East Daggas	100	16,959	35·9	D	1,208	202,685	414·4	1,096	181,484	338·2
F.S. Geduld	94	80,647	653·4	S	281	238,577	1904·2	221	164,334	1200·6
President Brand	115	94,642	838·0	S	347	285,793	2529·1	290	217,294	1809·1
President Steyn	99	39,193	184·1	S	307	121,670	577·8	271	106,071	535·2
S. A. Lands	90	18,764	44·1	D	1,151	240,564	664·9	1,079	232,470	642·7
Springs	101	13,891	11·6	D	1,247	170,960	157·6	1,500	173,547	106·5
Vaal Reefs	93	41,850	222·8	D	1,088	490,938	2596·9	882	398,932	2265·0
Welkom	95	30,220	71·7	S	291	92,130	229·5	270	81,387	232·1
Western Holdings	140	93,128	763·0	S	414	269,266	2174·0	296	173,112	1303·3
West. Reefs. Ex.	134	36,516	116·6	D	1,582	418,098	1277·2	1,332	319,419	786·3
Central Mining										
Blyvoor	123	80,867	615·1	J	770	504,878	3828·6	625	410,464	2982·3
City Deep	97	20,418	2·1	D	1,353	282,108	104·8	1,511	300,102	122·2
Cons. M.R.	75	15,480	6·0	J	560	105,585	44·7	879	121,978	88·5
Crown	207	34,113	14·4	D	2,626	419,708	168·4	2,751	420,393	176·3
D. Roodepoort	186	34,361	48·2	D	2,296	423,624	636·4	2,200	398,322	617·6
East Rand Prop.	203	54,291	93·6	D	2,625	684,712	1388·6	2,569	675,783	1701·0
Harmony	141	56,478	241·0	J	843	334,837	1499·0	584	234,588	915·3
Modder East	122	12,782	1·2	J	818	80,161	14·6	800	79,469	12·2
Rose Deep	25	4,504	2·1	D	434	61,719	25·5	615	81,975	27·9
J.C.I.*										
Freddies Cons.	54	13,015	L42·0	D	708	169,951	L448·3	639	178,805	L467·0
Govt. G.M.A.	51	10,617	1·0	D	635	128,348	L9·8	747	134,014	L0·4
Randfontein	28	5,372	5·1	D	415	71,983	94·4	310	51,252	61·0
Union Corporation										
East Geduld	132	39,257	259·4	D	1,653	493,950	3322·5	1,547	475,762	3261·9
Geduld Prop.	72	13,513	30·5	D	879	165,738	353·8	929	153,791	143·2
Grootvlei	210	43,890	223·0	D	2,555	538,309	2793·0	2,360	502,074	2553·7
Marievale	94	22,741	116·6	D	1,135	277,990	1377·3	891	232,567	1050·7
St. Helena	150	49,120	291·6	D	1,810	558,434	3126·9	1,468	429,306	2200·4
Van Dyk	69	12,537	19·8	D	891	166,877	321·8	913	168,135	291·2
Winkelhaak	79	22,917	85·7	D	908	235,111	587·2	—	—	—
General Mining										
Buffelsfontein	145	56,350	301·8	J	867	331,961	1745·7	721	243,523	1114·4
Ellaton	29	6,792	27·0	D	370	85,955	343·1	382	88,900	380·4
S. Roodepoort	30	7,235	22·9	J	180	42,875	137·2	179	42,270	143·4
Stilfontein	160	72,037	401·9	D	1,754	830,892	4891·7	1,399	699,212	4544·4
W. Rand Cons.	126	17,484	8·5	D	1,639	235,962	201·6	1,642	221,326	165·8
Anglo Transvaal										
Hartebeestfontein	101	48,480	293·1	J	577	295,895	1867·6	522	286,230	1921·4
Loraine	78	15,888	L19·0	S	240	48,488	L55·6	223	43,388	L56·9
N. Klerksdorp	10	1,234	L4·9	D	123	13,793	L95·1	121	13,054	L96·6
Rand Leases	163	24,857	4·1	J	1,133	168,310	147·7	1,082	157,051	70·8
Village M.R.	30	4,390	L1·1	J	280	27,800	3·6	163	28,408	4·0
Virginia O.F.S.	132	29,832	24·4	J	800	183,469	98·3	665	173,588	259·1
Others										
N. Kleinfontein	80	9,878	0·1	D	990	127,934	34·1	1,035	128,231	L19·1
Wit Nigel	18	4,272	4·4	J	100	26,182	30·4	107	25,853	37·2

Gold has been valued at 249s. 11d. per oz. fine (November 249s. 7d.) L indicates loss. † Working Profit. * Working Profit includes sundry revenue. Table excludes profits from Uranium, Pyrite and Acid, and also production fom Uranium divisions at Luipaards Vlei, Randfontein and W. Rand Consolidated.

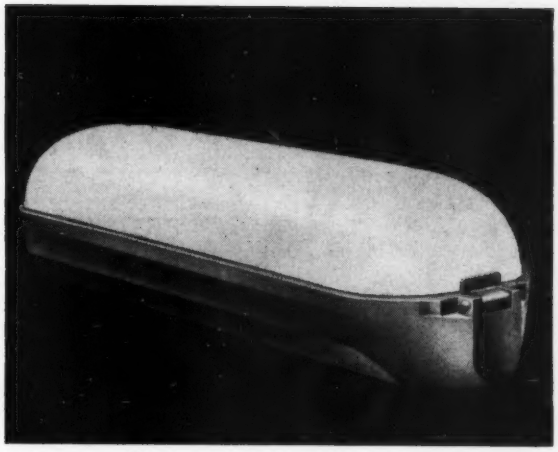
ESTIMATED URANIUM REVENUE

Company	Year ends	Dec. Profit (£000)	This year (cum.) (£000)	Last year (cum.) (£000)	Company	Year ends	Dec. Profit (£000)	This year (cum.) (£000)	Last year (cum.) (£000)
Gold Fields					**J.C.I.**				
Doornfontein	J	14·0	87·0	90·0	E. Champ d'Or (*b*)	D	7·1*	82·7*	73·0*
Luipaards Vlei (*a*)	J	91·0	558·0	538·0	Freddies Cons.	D	36·0*	424·0*	345·0*
Vogels	D	52·0	631·0	636·0	Govt. G.M.A.	D	23·0*	267·7*	294·4*
West Drie	J	50·0	300·0	276·0	Randfontein (*a*)	D	110·1*	1288·5*	1322·6*
Anglo American					**General Mining**				
Daggafontein	D	144·2	1666·1	1687·0	Buffelsfontein	J	212·0	1271·0	1176·0
P. Brand	S	46·1	136·9	147·0	Ellaton	D	17·0	214·0	203·0
P. Steyn	S	60·2	179·9	187·0	Stilfontein	D	96·0	1043·0	1100·0
Vaal Reefs	D	143·2	1719·6	1496·0	W. Rand Cons. (*a*)	D	211·6	2431·7	2665·1
Welkom	S	57·4	171·2	180·0					
West. Reefs Ex.	D	166·6	1918·2	1848·0	**Anglo Transvaal**				
					Hartebeestfontein	J	260·0	1572·6	1549·6
Central Mining					Loraine	S	36·0	109·0	101·0
Blyvoor	J	155·0	922·4	914·1	N. Klerksdorp	D	11·0	131·5	140·5
Harmony	J	190·1	1165·0	834·0	Virginia O.F.S.	J	174·6	1062·4	1115·0

Table includes profit from uranium, acid and pyrite before loan redemption. (*a*) Total profit from uranium section. (*b*) Overall profit. *Net revenue after provision for loan redemption.

Machinery and Equipment

A Portable Gas Interferometer



The miniature fluorescent lighting fitting by Victor Products (Wallsend) Ltd.

Interferometry has long been used for quantitative gas analyses. To obtain the highest measuring accuracy, interferometers with long chambers up to 1 m. in length are used and can, therefore, only serve for stationary use in the laboratory. To analyse air specimens, portable gas interferometers have already been produced permitting immediate measurements of the air on the spot. The apparatus recently designed at VEB Carl Zeiss Jena follows the tradition of these previous instruments, especially the mining gas interferometers for methane content determination below ground, but it also takes into consideration the universal application of measuring any binary gaseous mixtures as well as the prevailing regulations for protection against fire-damp and explosions.

The optical measuring device is based on the Rayleigh inteference principle which has been realized in an autocollimation arrangement according to Löwe. A standard bulb 2.5 V 0.2 A is used as light source and is fed by torch batteries (11) and switched on by a push-button switch (19). The bulb illuminates the entrance slit (3) via a condenser lens and a deviating prism. This slit is in the focal plane of the lens system (7) so that the resulting beam of light is parallel. It passes through the compensation device (8,9) and the double chamber (10) and is then incident almost vertically on the mirror (13). Very close in front of this is a double aperture which separates from the whole light beam two partial beams which are capable of interference. The mirror (13) is tilted slightly sideways in such a manner that the light, after passing again through the double chamber, the compensator and the lens system combines in the focal plane of the objective, close to the entrance slit, producing there the interference image. This is viewed with the cylindrical lens (2) through the eyepiece (1) magnified laterally 180 times.

The two sides of the double chamber are filled with fresh air by means of a rubber-ball hand pump (16) via the absorption tube (15) and the reversible tap (18). The reversible valve directs the fresh air into the "comparison chamber" and the specimen into the "measuring chamber". As required, the absorption tube is filled with silica gel for drying the air and with soda lime for CO_2-absorption. To maintain the same pressure in both chambers, they are connected on their exit sides to the outside atmosphere. On the comparison chamber there is an $1\frac{1}{2}$ m. long pressure compensating tube (12) to prevent the outside air from diffusing into the chamber during a protracted series of measurements. Prior and subsequent to each series the two parts of the chamber are filled with fresh and dry outside air and the interference fringes set to zero by means of an adjusting screw (17).

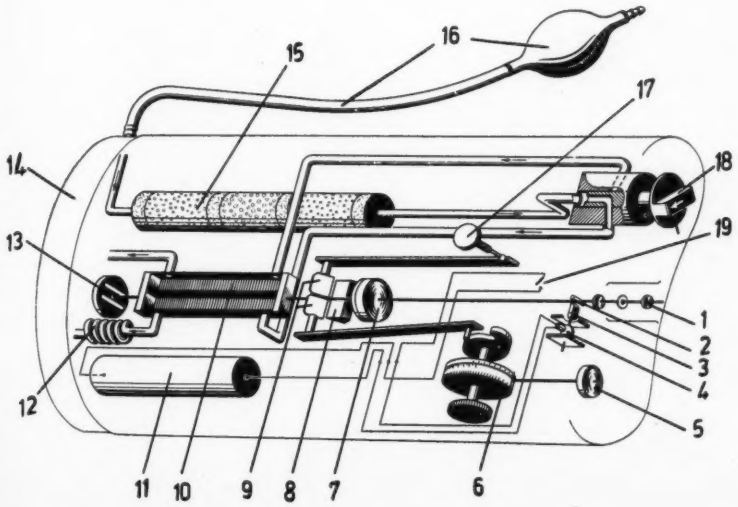
When filling the measuring chamber with a binary gas mixture a phase difference between the interfering light beams occurs, this becoming apparent by a displacement of the interference fringes. By turning one of the two compensator plates (9), the phase difference is compensated, i.e., the zero-fringe which is distinguished by its limiting colourless interference minimum as compared to the other inference fringes, is brought back to its initial position. A second system of interference fringes serves as zero-mark for this purpose. It is produced by two beams running alongside below and which traverse the plano-parallel glass plate (8) between the objective (7) and the mirror (13). This glass plate causes the fixed comparison system in the eyepiece to approach close to the moveable one, thus permitting a very accurate coincidence setting of the two fringe systems.

The movable compensator plate is turned by a lever which—with a bolt—runs in a spiral cam disc. This cam disc is turned coaxially with the measuring wheel and the reading scales (6). A special feature of the measuring device is the Archimedes' helix of the cam disc rising slowly in the lower measuring range up to h=5 fringes, and quickly in the higher measuring range from h=5 to h=60 fringes, this being shown by the divisions of the two dials. This permits accurate reading at lower concentrations and, at the same time, the measurement of higher concentrations without the accuracy being appreciably impaired.

The phase difference and thus the fringe displacement, which is designated as a multiple h of an average wavelength (green Hg-light 546 m/u) or for short as a "fringe number h", is proportional to the concentration of the mixture. On the left the dial number of fringes h is read directly and from this the concentration of any gas or vapour can be easily determined by multiplying with a conversion factor U. This factor U depends not only on the characteristics of the interferometer but also on the optical data of the gases.

One of the principal applications of the gas interferometer is the determination of methane in underground mines. To obviate any calculations with these measurements, a second scale, already divided into CH_4 per cent, was placed next to the h-scale. Up to 9,5 per cent CH_4 it is divided into tenth-per cent, from 10 to 100 per cent into whole CH_4 per cent. For this, it is assumed that the factor G=1. Both scales can be easily read through a magnifying glass (5) on the left of the eyepiece.

Diagrammatic illustration of the Zeiss portable gas interferometer Model 10



The newly-designed gas interferometer has already satisfied various requirements. The absolute calibration for methane percentage was carried out at the VEB Leunawerke Walter Ulbricht. Methane determinations in actual practice below ground were made in potash mines of the Stassfurt mining region, as recently the occurrence of methane had been noticed in potash mining. No significant proportion of methane was, however, detected, in any gallery on these particular occasions.

MINIATURE FLUORESCENT LIGHTING FITTING

A miniature fluorescent lighting fitting for two 12 in. 8 watt tubular fluorescent lamps has recently been completed by Victor Products (Wallsend) Ltd. This unit is of particular application in mine surface installations, namely sorting sheds, drill shops and the like. Supply voltage is normally 220 to 250 a.c. 50 cycle single phase at 26 watt electrical rating. Light output is 640 lumens average through the first 5,000 hours of lamp life and the light output ratio 82 per cent.

The fitting is 15.6 in. long, 3.8 in. high and 4.6 in. wide. With two lamps it weighs 7½ lb.

The cover is manufactured in Perspex Opal 040, and the whole equipment is dust and weather proof, corrosion resistant, and has a lamp life of 12 months when operated continuously. Conduit entry is at either end or the back or the B.S conduit box at rear or any flat surface or corner.

NEW DESIGN OF MOTOR

An addition to their range of industrial motors is announced by the Motor and Control Gear Division of Associated Electrical Industries Ltd.

The new motor is designated Type KN-D and is of the squirrel-cage induction class, totally enclosed fan-cooled, with ribbed frame and endshields. Class "E" insulation is used, permitting a maximum temperature rise of 65 deg. C. The machine complies electrically with BS.2613 : 1957 and its dimensions are such that it is completely interchangeable, rating for rating, with the ventilated (AEI Type KN-C) British Standard Dimension motor built in accordance with BS. 2960 : 1958.

The use of the improved insulation makes it possible to offer a motor of smaller dimensions at a lower price than the earlier Class "A" insulated 55 deg. C. rise British Standard Dimension machine which it replaces. The new motor is immediately available in sizes up to 7½ h.p. but at a later date the range will be extended to 40 h.p. at 1,500 r.p.m.

QUICKLY DISMANTLED DRAGLINE

To facilitate dismantling, transfer and re-erection, a new walking dragline being used on opencast coal mining at Heddon-on-the-Wall, Northumberland, has been constructed by a combination of welding and bolting methods.

Twelve major welding runs, totalling 150 ft. are necessary for the assembly of the main units of the dragline structure and seven major welded assemblies form the main base and superstructure elements. Each assembly is complete with the machinery, drive and other components ready for quick mechanical or electrical inter-connection. The main units are first bolted together and then welds are made along prepared adjoining edges of the main plate members to complete a rigid structure. The welding can be carried out in positions which permit down-hand working. To dismantle the machine the welds are severed by flame-cutting.

A second machine of this type carries a 7 cu. yd. bucket on a 140 ft. boom, or a 5 cu. yd. bucket on a 180 ft. boom. It has a total working weight of 380 tons and is capable of cutting to depths of 125 ft. With easily handled materials and under normal operating conditions, the cycle of dragging, hoisting, slewing through 90 deg., discharging and returning takes about 50 seconds.

PEBBLE MILLING PRACTICE

An excellent review of pebble milling practice on the Rand has recently been completed by O. A. E. Jackson. Covering a wide field and giving a great deal of valuable information on performances, an adequate precis is difficult to provide.

The trend towards larger mills is brought home when one realizes that before 1930, 5½ ft. x 22 ft. mills were almost standard whereas in 1948 two 21 ft. x 16 ft. pebble mills were installed as a self-contained unit at Grootvlei and have proved very satisfactory, being cheaper in capital cost per ton of —200 mesh produced. Pebble consumption on the larger diameter mills, however, is apparently heavier but in view of the usual size distribution of run of mine ore, this causes no embarrassment. All mills are of the low level type and various types of lining are used. The Osborn type is popular with primary mills but white-iron block lenses cast in wave or saw-tooth form are employed in the final milling stages because the smaller pebbles do not pack satisfactorily within the standard spacing of the Osborn bars.

In conclusion the author states that it has been established that for South African gold ores, the use of pebbles as grinding media is considerably more economic than addition of steel balls or rods. Although steel is sometimes used in primary milling, recent experience has shown that in nearly all cases, it would be eliminated by the preparation of finer mill feed. The importance of accurate sampling and screen analysis in all work in grinding is also stressed.

Technical Briefs

Relationship between Particle Size and Collector Concentration

In a paper read to the I.M.M. on December 17, A. J. Robinson discusses the relationship between the particle size and collector concentration in flotation.

On the basis that it should be possible to predict flotation recovery from existing theories concerning the relationship between collector concentration and gas-solid adhesion, the author has carried out a large number of batch flotation tests in the system quartz-dodecylamine and analysed the results in terms of particle size and collector concentration.

At low collector concentrations, a general agreement is shown between the results of batch-tests and predictions of the theoretical relationship between particle size and the minimum contact angles which permit flotation. It is only true for the lower concentrations, however, but it appears that a relationship must exist between the size of the largest particle which will float and the collector concentration. This is to be expected since the magnitude of the contact angle is governed by collector concentration. Present theories only predict threshold collector concentration and to obtain reasonable recovery of a specific size fraction, the collector concentration must exceed the minimum predicted by theory. Despite this excess, the theoretical differences which exist between the floatability of coarse and fine particles is preserved in practice.

From a practical point of view this means that to float a long range feed, high collector concentration must be employed and since many operations involving selective flotation depend on collector concentration, strict control of particle size is desirable. Practical ways to achieve better separation are discussed, such as classifying flotation tailing followed by reflotation of the classified products and the use of separate circuit for coarse and fine feeds.

This procedure has also been suggested in a report issued by the Missouri School of Mines and Metallurgy and based on experiment work. In this case, however, the reason was thought to be the necessity for different impeller speeds and air volume inputs if optimum flotation is to be achieved for each size range. (*The Mining Journal* Annual Review 1957.) It may well be that there is a connection between bubble size, collector concentration and the dynamics within the cell, and the particle size of the mineral to be floated.

FLOTATION OF PYRRHOTITE USING CATIONIC COLLECTOR

Some of the Kamaishi pyrrhotite is difficult to float with a xanthate and only 17 per cent recovery is reported with 200 gms. per ton of ethyl xanthate. If however, the cationic collector, R.A.D.A., is used amounting to only 40 g. per ton of ore, more than 96 per cent can be recovered.

By this reagent and introducing a cationic flotation stage after the normal flotation with a sulphydric reagent, it is possible to greatly improve the recovery and magnetic separation used to recover unfloated mineral, can be eliminated from the flowsheet

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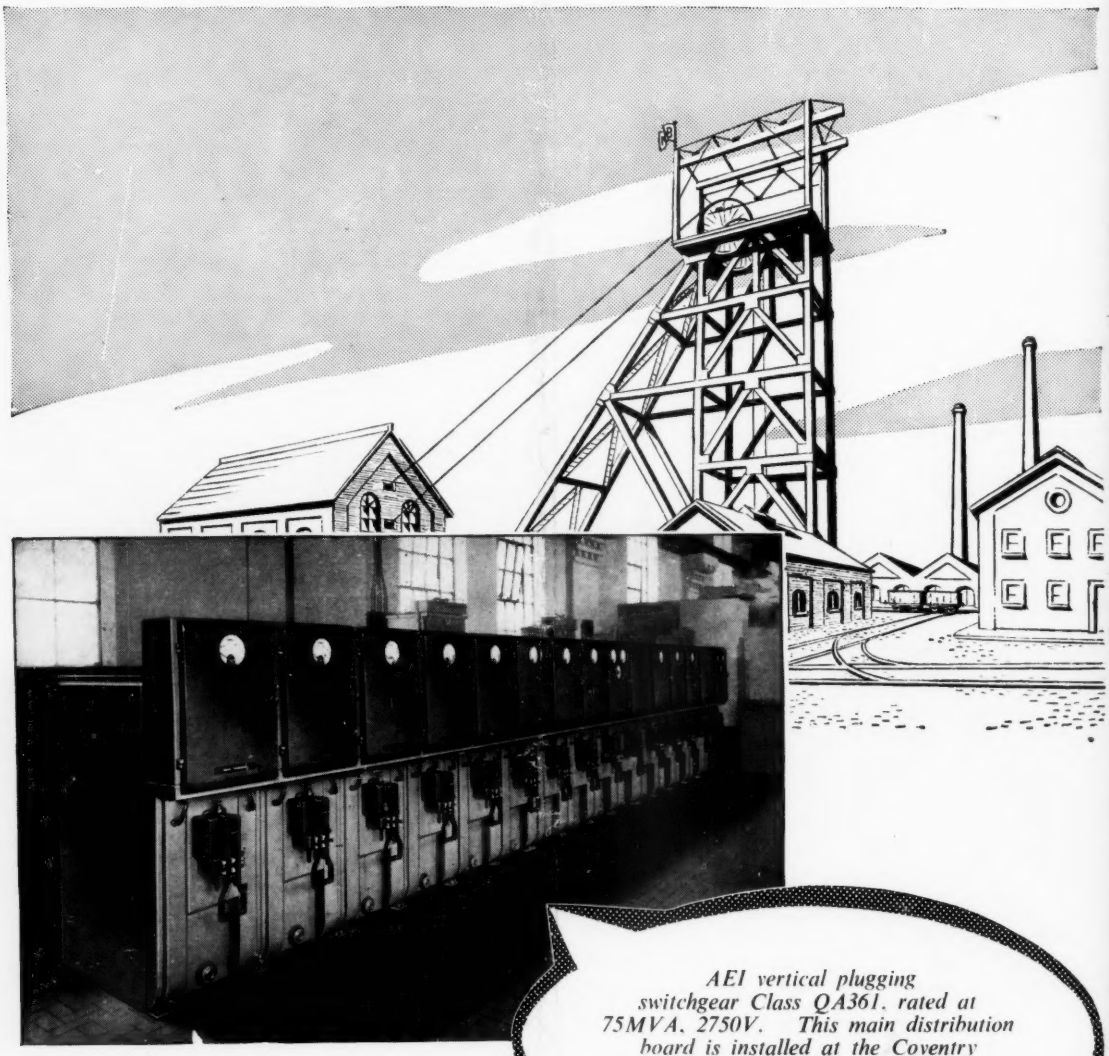

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